



SAR EVALUATION REPORT

**FCC 47 CFR § 2.1093
IEEE Std 1528-2013**

For

WCDMA/LTE Tablet + BT/BLE and DTS/UNII a/b/g/n/ac

FCC ID: A3LSMW728

Model Name: SM-W728, SM-W727, SM-W727N0, SM-W728N0

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Prepared for

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TL-637

Revision History

Rev.	Date	Revisions	Revised By
V1	2/17/2017	Initial Issue	SeongGon Lee
V2	2/21/2017	Added note.3 in Sec.7.2	SeongGon Lee

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1. Attestation of Test Results

Applicant Name	SAMSUNG ELECTRONICS CO.,LTD.			
FCC ID	A3LSMW728			
Model Name	SM-W728, SM-W727, SM-W727N0, SM-W728N0			
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013			
Exposure Category	SAR Limits (W/Kg)			
	Peak spatial-average(1g of tissue)			
General population / Uncontrolled exposure	1.6			
RF Exposure Conditions	Equipment Class - Highest Reported SAR (W/kg)			
	Licensed	DTS	U-NII	DSS (BT)
Standalone	0.795	0.549	0.586	0.565
Simultaneous TX	1.352	1.315	1.352	1.331
Date Tested	1/11/2017 to 2/16/2017			
Test Results	Pass			
<p>Note: SM-W728 and multi-models(SM-W727, SM-W727N0, SM-W728N0) are same hardware, but difference is Windows version and HSDPA categories. PED document described detail of difference. All compliance tests were performed using SM-W728 and HSDPA conducted power checks for multi-models were performed.</p>				
<p>UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.</p> <p>Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.</p>				
Approved & Released By:		Prepared By:		
				
Justin Park Senior Engineer UL Korea, Ltd. Suwon Laboratory		SeongGon Lee Laboratory Technician UL Korea, Ltd. Suwon Laboratory		

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2013, the following FCC Published RF exposure [KDB](#) procedures:

- 248227 D01 802.11 Wi-Fi SAR v02r02
- 447498 D01 General RF Exposure Guidance v06
- 616217 D04 SAR for laptop and tablets v01r02
- 690783 D01 SAR Listings on Grants v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 941225 D01 3G SAR Procedures v03r01
- 941225 D05 SAR for LTE Devices v02r05
- 941225 D06 Hotspot Mode v02r01

3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at

Suwon
SAR 1 Room
SAR 2 Room
SAR 3 Room

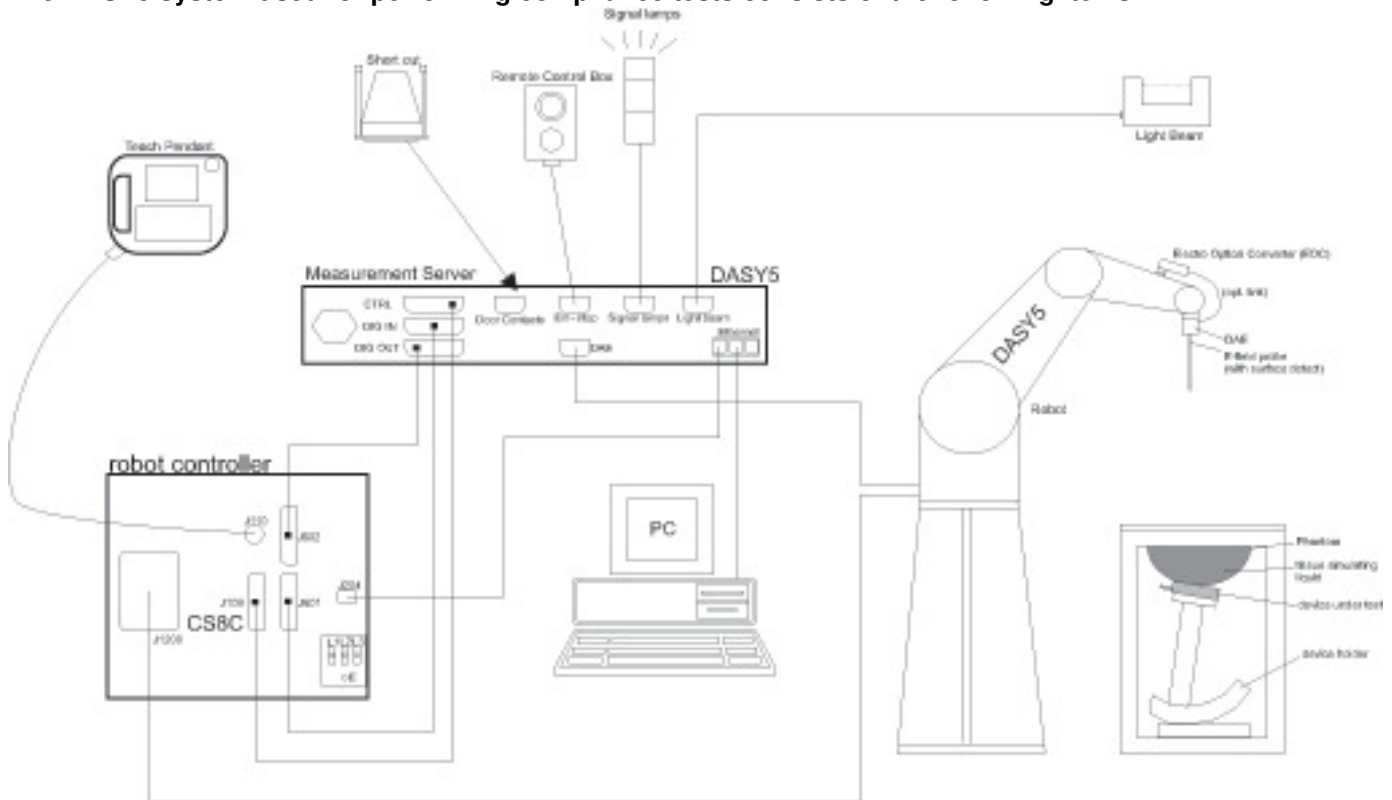
UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637.

The full scope of accreditation can be viewed at <http://www.iasonline.org/PDF/TL/TL-637.pdf>.

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

The DASY5 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

4.2. SAR Scan Procedures

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Area Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: Δx_{Area} , Δy_{Area}	≤ 2 GHz: ≤ 15 mm $2 - 3$ GHz: ≤ 12 mm	$3 - 4$ GHz: ≤ 12 mm $4 - 6$ GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be \leq the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

		≤ 3 GHz	> 3 GHz	
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$		≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm *	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{\text{Zoom}}(n)$	≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm	
	graded grid	$\Delta z_{\text{Zoom}}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{\text{Zoom}}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$	
Minimum zoom scan volume	x, y, z	≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm	
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.				
* When zoom scan is required and the <i>reported</i> SAR from the area scan based <i>1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan (FCC only)

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be larger than the step size in Z-direction.

4.3. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	E5071C	MY46522054	8-18-2017
Dielectric Assessment Kit	SPEAG	DAK-3.5	1196	7-26-2017
Shorting block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	LKM	DTM3000	3424	8-17-2017
Thermometer	Lutron	MHB-382SD	AH.91478	8-10-2017

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
MXG Analog Signal Generator	Agilent	N5181A	MY50145882	8-16-2017
Power Sensor	Agilent	U2000A	MY54260010	8-17-2017
Power Sensor	Agilent	U2000A	MY54260007	8-17-2017
Power Amplifier	EXODUS	1410025-AMP2027-10003	10003	8-17-2017
Directional Coupler	Agilent	772D	MY52180193	8-17-2017
Directional Coupler	Agilent	778D	MY52180432	8-17-2017
Low Pass Filter	MICROLAB	LA-15N	03943	8-17-2017
Low Pass Filter	FILTRON	L14012FL	1410003S	8-17-2017
Low Pass Filter	MICROLAB	LA-60N	03942	8-17-2017
Attenuator	Agilent	8491B/003	MY39269292	8-17-2017
Attenuator	Agilent	8491B/010	MY39269315	8-17-2017
Attenuator	Agilent	8491B/020	MY39269298	8-17-2017
E-Field Probe (SAR1)	SPEAG	EX3DV4	7376	8-30-2017
E-Field Probe (SAR2)	SPEAG	EX3DV4	7330	2-24-2017
E-Field Probe (SAR3)	SPEAG	EX3DV4	7314	9-27-2017
Data Acquisition Electronics (SAR1)	SPEAG	DAE4	1447	9-19-2017
Data Acquisition Electronics (SAR2)	SPEAG	DAE4	1468	9-8-2017
Data Acquisition Electronics (SAR3)	SPEAG	DAE4	1494	7-18-2017
System Validation Dipole	SPEAG	D750V3	1122	8-30-2017
System Validation Dipole	SPEAG	D835V2	4d194	7-20-2017
System Validation Dipole	SPEAG	D1900V2	5d199	2-19-2017
System Validation Dipole	SPEAG	D2450V2	939	9-23-2017
System Validation Dipole	SPEAG	D5GHzV2	1184	9-1-2017
Thermometer (SAR1)	Lutron	MHB-382SD	AH.91463	8-10-2017
Thermometer (SAR2)	Lutron	MHB-382SD	AH.50215	8-17-2017
Thermometer (SAR3)	Lutron	MHB-382SD	AH.50213	8-17-2017

Other

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	150313	8-16-2017
Base Station Simulator	R & S	CMW500	150314	8-16-2017
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	8-18-2017

5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	Overall (Length x Width): 287.5 mm x 196.0 mm Overall Diagonal: 348.0 mm Display Diagonal: 315.0 mm																		
Back Cover	<input checked="" type="checkbox"/> The rechargeable battery is not user accessible.																		
Battery Options	<input checked="" type="checkbox"/> The rechargeable battery is not user accessible.																		
Accessory	Keyboard and S-pen.																		
Wireless Router (Hotspot)	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices. <input checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 2.4 GHz)																		
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other <input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 2.4 GHz) <input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 5 GHz)																		
Test sample information	<table border="1"> <thead> <tr> <th>No.</th> <th>S/N</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>9CKCR32HC000Q8</td> <td>Main Conduction</td> </tr> <tr> <td>2</td> <td>9CKCR32HC000RZ</td> <td>Wi-Fi & BT Conduction</td> </tr> <tr> <td>3</td> <td>9CKCR32HC000RD</td> <td>SAR</td> </tr> <tr> <td>4</td> <td>9CKCR32HC000QF</td> <td>SAR</td> </tr> <tr> <td>5</td> <td>9RKCR32HC000QD</td> <td>SAR</td> </tr> </tbody> </table>	No.	S/N	Notes	1	9CKCR32HC000Q8	Main Conduction	2	9CKCR32HC000RZ	Wi-Fi & BT Conduction	3	9CKCR32HC000RD	SAR	4	9CKCR32HC000QF	SAR	5	9RKCR32HC000QD	SAR
No.	S/N	Notes																	
1	9CKCR32HC000Q8	Main Conduction																	
2	9CKCR32HC000RZ	Wi-Fi & BT Conduction																	
3	9CKCR32HC000RD	SAR																	
4	9CKCR32HC000QF	SAR																	
5	9RKCR32HC000QD	SAR																	

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
W-CDMA (UMTS)	Band II Band V	UMTS Rel. 99 (Voice & Data) HSDPA (category 24) HSUPA (category 6) DC-HSDPA (category 24) HSPA+ (category 24)	100%
LTE	FDD Band 5 FDD Band 17	QPSK 16QAM <input checked="" type="checkbox"/> Rel. 10 Does not support Carrier Aggregation (CA)	100 % (FDD)
	Does this device support SV-LTE (1xRTT-LTE)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)	100%
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT20) 802.11ac (VHT40) 802.11ac (VHT80)	100%
	Does this device support bands 5.60 ~ 5.65 GHz? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
	Does this device support Band gap channel? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Bluetooth	2.4 GHz	Version 4.1 LE	76.83% (DH5)

6.3. Nominal and Maximum Output Power from Tune-up Procedure

KDB 447498 sec.4.1.(3) at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit

Upper limit (dB):		Max. RF Output Power (dBm)		Reduction RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit	Target	Max. tune-up tolerance limit
W-CDMA Band V	R99	23.0	23.5	16.5	17.0
	HSDPA	22.5	23.0	16.5	17.0
	HSUPA	22.5	23.0	16.5	17.0
	DC-HSDPA	22.5	23.0	16.5	17.0
W-CDMA Band II	R99	22.5	23.0	12.0	12.5
	HSDPA	22.0	22.5	12.0	12.5
	HSUPA	22.0	22.5	12.0	12.5
	DC-HSDPA	22.0	22.5	12.0	12.5
LTE Band 5	QPSK	24.0	24.5	17.5	18.0
LTE Band 17	QPSK	22.5	23.0	17.0	17.5

Upper limit (dB):		Max. RF Output Power (dBm)		Reduction RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit	Target	Max. tune-up tolerance limit
WiFi 2.4 GHz (Ch. 1~11)	802.11b	14.0	14.5	8.0	8.5
	802.11g	12.0	12.5	8.0	8.5
	802.11n HT20	12.0	12.5	8.0	8.5
WiFi 2.4 GHz (Ch. 12)	802.11b	8.0	8.5	8.0	8.5
	802.11g	8.0	8.5	8.0	8.5
	802.11n HT20	8.0	8.5	8.0	8.5
WiFi 2.4 GHz (Ch. 13)	802.11b	8.0	8.5	8.0	8.5
	802.11g	3.0	3.5	3.0	3.5
	802.11n HT20	2.0	2.5	2.0	2.5
WiFi 5 GHz	802.11a	12.0	12.5	7.0	7.5
	802.11n HT20	12.0	12.5	7.0	7.5
	802.11n HT40	10.0	10.5	7.0	7.5
	802.11ac VHT20	11.0	11.5	7.0	7.5
	802.11ac VHT40	10.0	10.5	7.0	7.5
	802.11ac VHT80	10.0	10.5	7.0	7.5
Bluetooth		9.5	10.0	N/A	
Bluetooth LE		4.0	4.5	N/A	

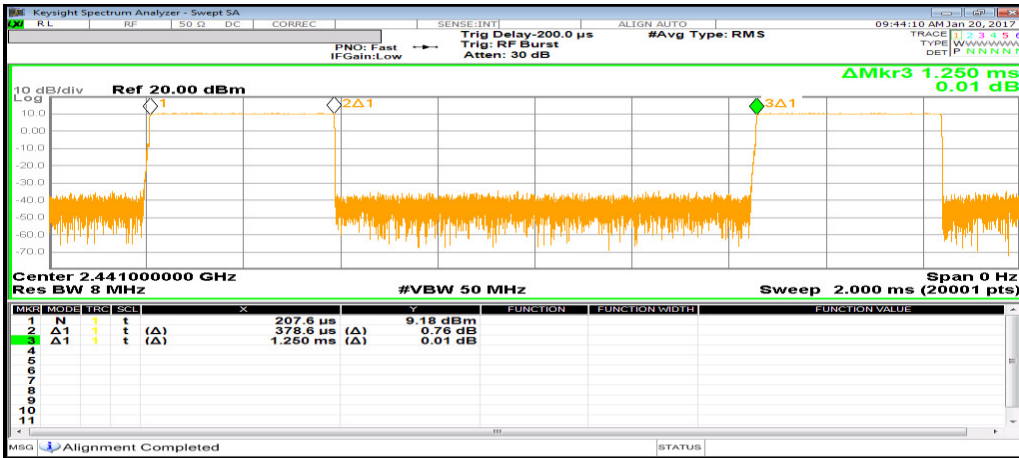
6.4. General LTE SAR Test and Reporting Considerations

Item	Description																																						
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 5	Frequency range: 824 - 849 MHz																																					
		Channel Bandwidth																																					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																
	Low			20450/ 829	20425/ 826.5	20415/ 825.5	20407/ 824.7																																
	Mid			20525/ 836.5	20525/ 836.5	20525/ 836.5	20525/ 836.5																																
	High			20600/ 844	20625/ 846.5	20635/ 847.5	20643/ 848.3																																
	Band 17	Frequency range: 704 - 716 MHz																																					
		Channel Bandwidth																																					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																
	Low			23780/ 709	23755/ 706.5																																		
	Mid			23790/ 710	23790/ 710																																		
	High			23800/ 711	23825/ 713.5																																		
	LTE transmitter and antenna implementation	LTE 5,17 has 1 Main TX/RX Ant and 1 Diversity RX Ant Refer to Appendix A...																																					
Maximum power reduction (MPR)	<p align="center">Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3</p> <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th> <th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th> <th rowspan="2">MPR (dB)</th> </tr> <tr> <th>1.4 MHz</th> <th>3.0 MHz</th> <th>5 MHz</th> <th>10 MHz</th> <th>15 MHz</th> <th>20 MHz</th> </tr> </thead> <tbody> <tr> <td>QPSK</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 2</td> </tr> </tbody> </table> <p>MPR Built-in by design A-MPR (additional MPR) was disabled during SAR testing</p>	Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1	16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1	16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)																																
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz																																	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1																																
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1																																
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2																																
Power reduction	Yes																																						
Spectrum plots for RB configurations	A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.																																						

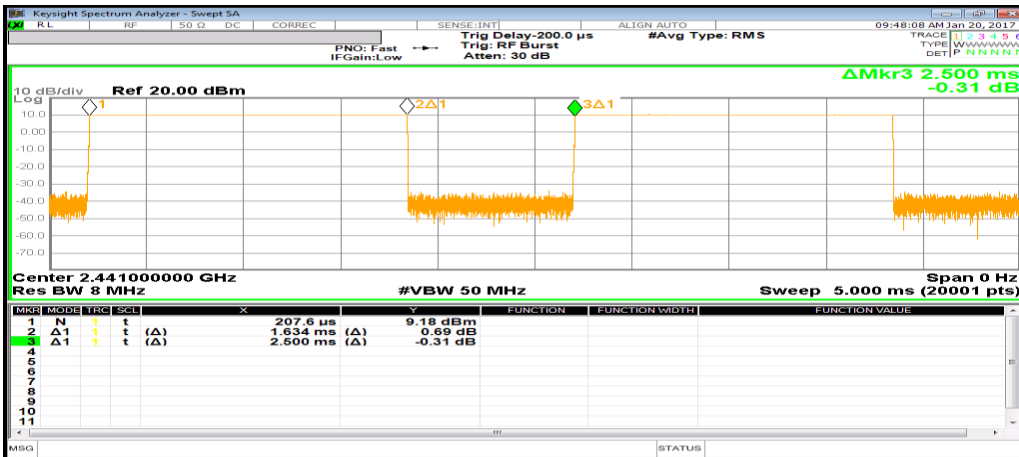
6.5. Bluetooth duty cycle Considerations

Time domain plots

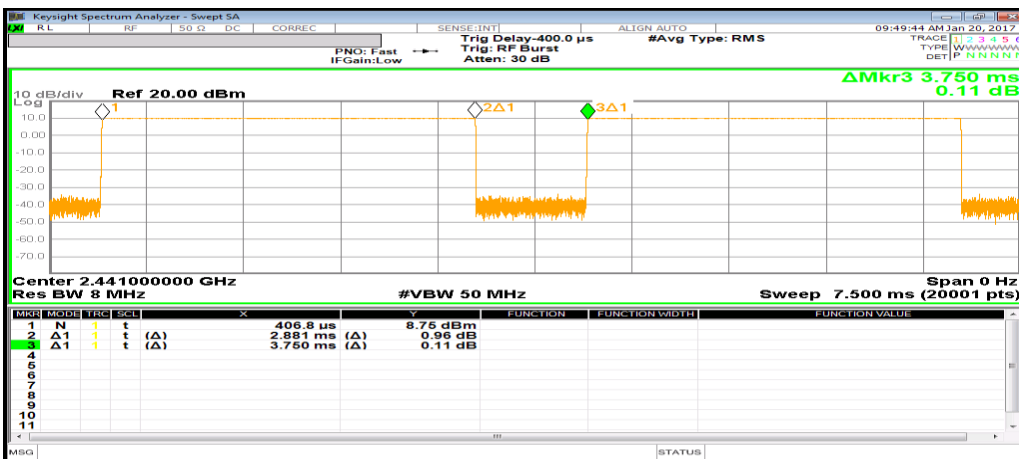
1. DH1 mode (Duty Cycle : $(0.379 \text{ ms} / 1.25 \text{ ms}) * 100 = 30.32 \%$)



2. DH3 mode (Duty Cycle : $(1.634 \text{ ms} / 2.5 \text{ ms}) * 100 = 65.36 \%$)



3. DH5 mode (Duty Cycle : $(2.881 \text{ ms} / 3.75 \text{ ms}) * 100 = 76.83 \%$)



Note(s):

Bluetooth duty cycle was measured using Bluetooth tester equipment with Bluetooth protocol. DH5 mode is highest duty cycle and both Conducted power and SAR test were performed at DH5 mode.

6.6. Power Reduction by Proximity Sensing

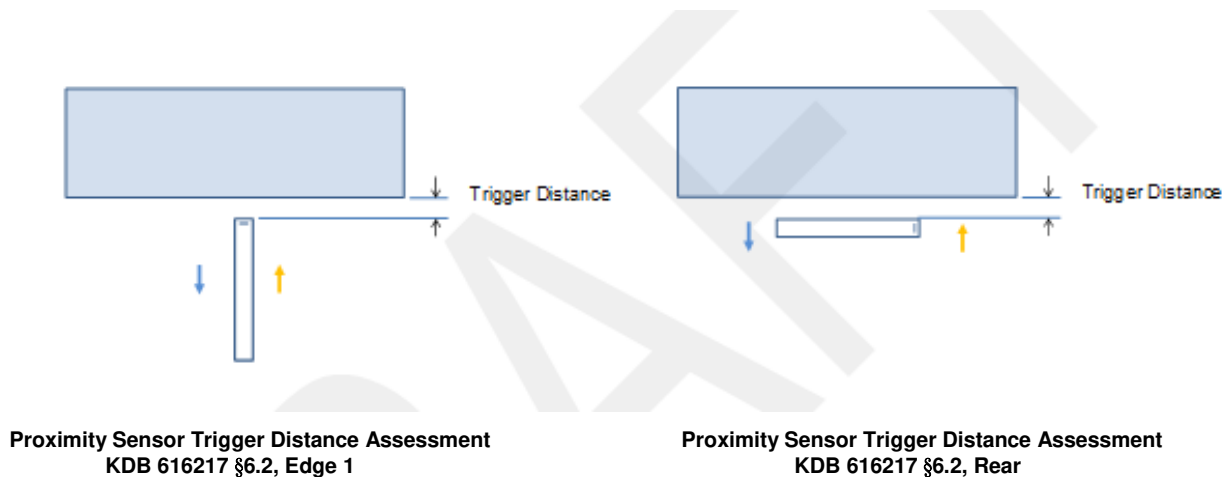
6.6.1. Proximity Sensor Triggering Distance (KDB 616217 §6.2)

Rear of the DUT was placed directly below the flat phantom. The DUT was moved toward the phantom in accordance with the steps outlined in KDB 616217 §6.2 to determine the trigger distance for enabling power reduction. The DUT was moved away from the phantom to determine the trigger distance for resuming full power.

The measurement was then repeated for the surface of Edge 1 and Rear.

The DUT featured a visual indicator on its display that showed the status of the proximity sensor (Triggered or not triggered). This was used to determine the status of the sensor during the proximity sensor assessment as monitoring the output power directly was not practical without affecting the measurement.

It was confirmed separately that the output power was altered according to the proximity sensor status indication. This was achieved by observing the proximity sensor status at the same time as monitoring the conducted power. Section 9 contains both the full and reduced conducted power measurements.



LEGEND

- ➔ Direction of DUT travel for determination of power reduction triggering point
- ➔ Direction of DUT travel for determination of full power resumption triggering point

Summary of Trigger Distances

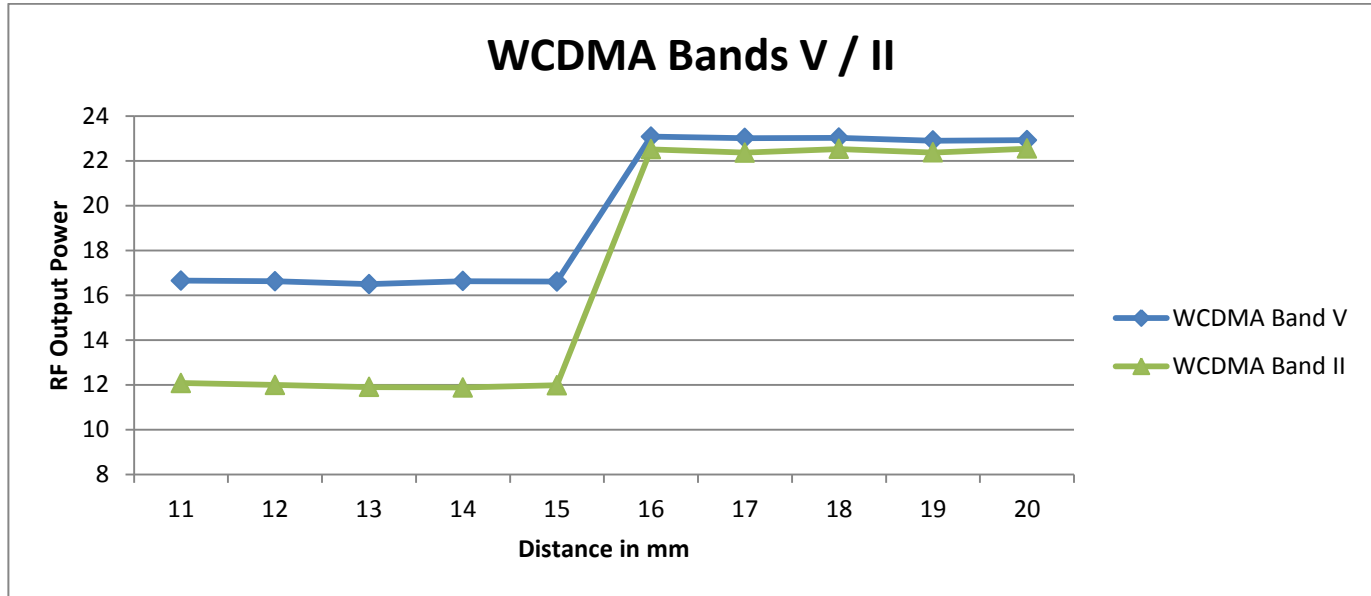
Tissue simulating liquid	Trigger distance - Rear		Trigger distance - Edge 1	
	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom
750 muscle	15 mm	15 mm	21 mm	21 mm
850 muscle	15 mm	15 mm	21 mm	21 mm
1900 muscle	15 mm	15 mm	21 mm	21 mm
2450 muscle	7 mm	7 mm	7 mm	7 mm
5000 muscle	7 mm	7 mm	7 mm	7 mm

Proximity Sensor Triggering Distance Measurement Results

WCDMA Bands II / V

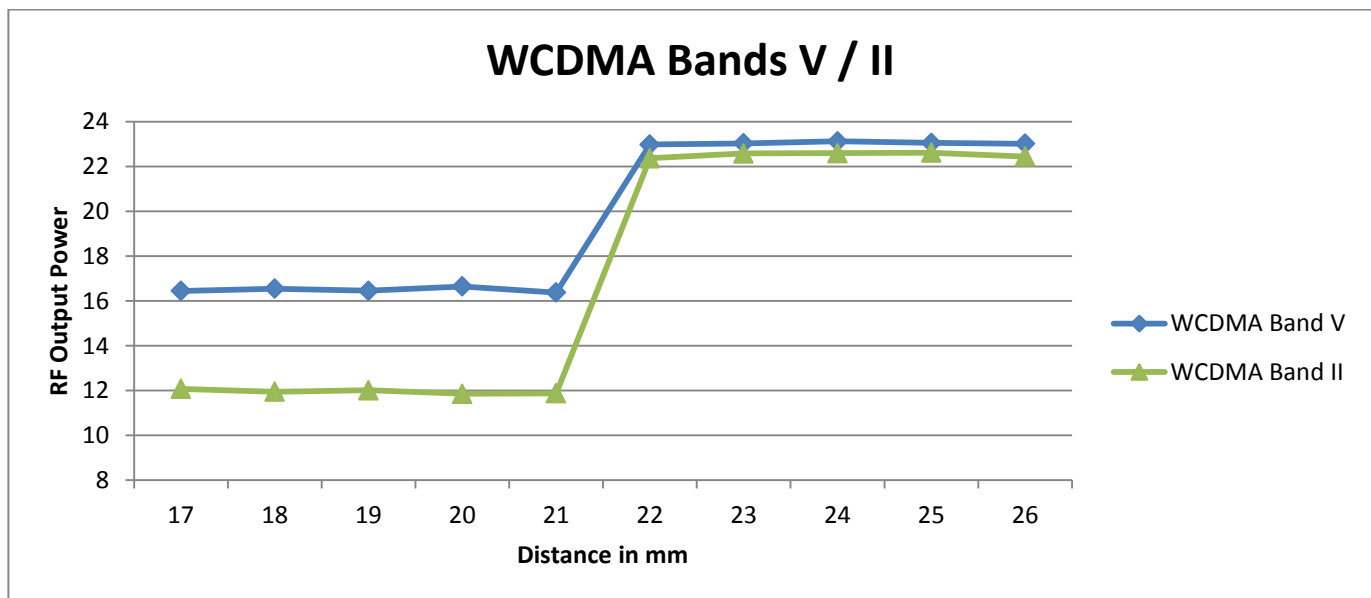
Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance (mm)	11	12	13	14	15	16	17	18	19	20
WCDMA Band V	16.7	16.6	16.5	16.6	16.6	23.1	23.0	23.0	22.9	22.9
WCDMA Band II	12.1	12.0	11.9	11.9	12.0	22.5	22.4	22.5	22.4	22.5



Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

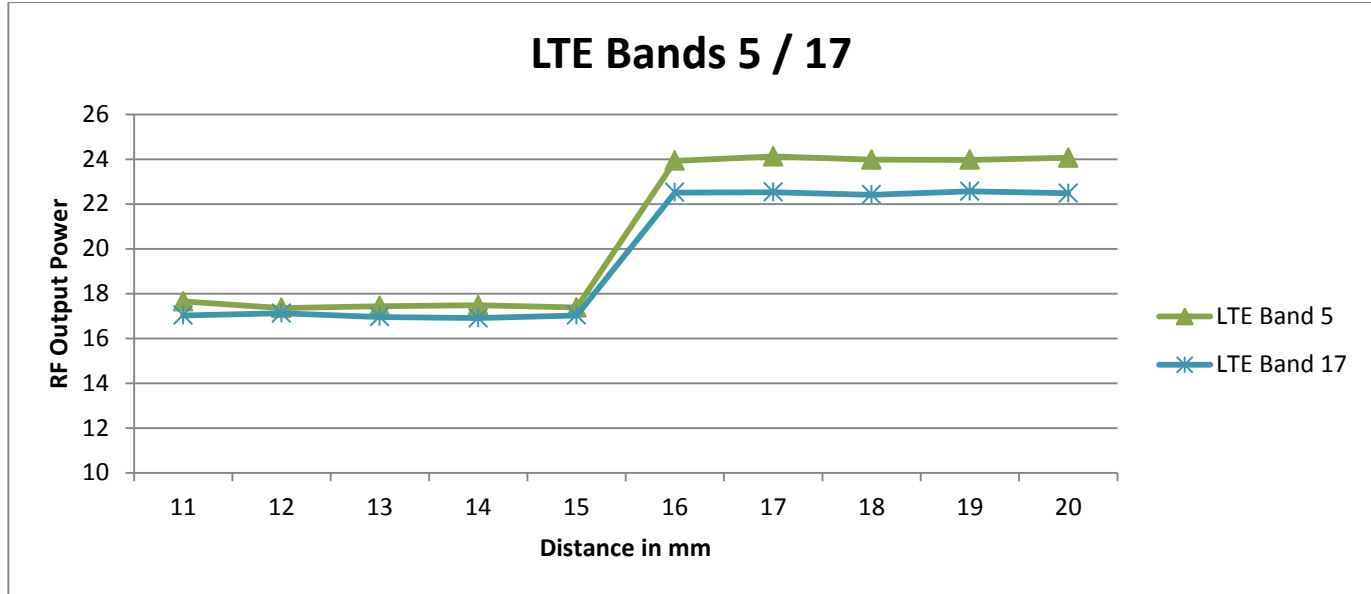
Distance to DUT vs. Output Power in dBm										
Distance (mm)	17	18	19	20	21	22	23	24	25	26
WCDMA Band V	16.4	16.5	16.5	16.6	16.4	23.0	23.0	23.1	23.1	23.0
WCDMA Band II	12.1	11.9	12.0	11.9	11.9	22.4	22.6	22.6	22.6	22.4



LTE Bands 5 / 17

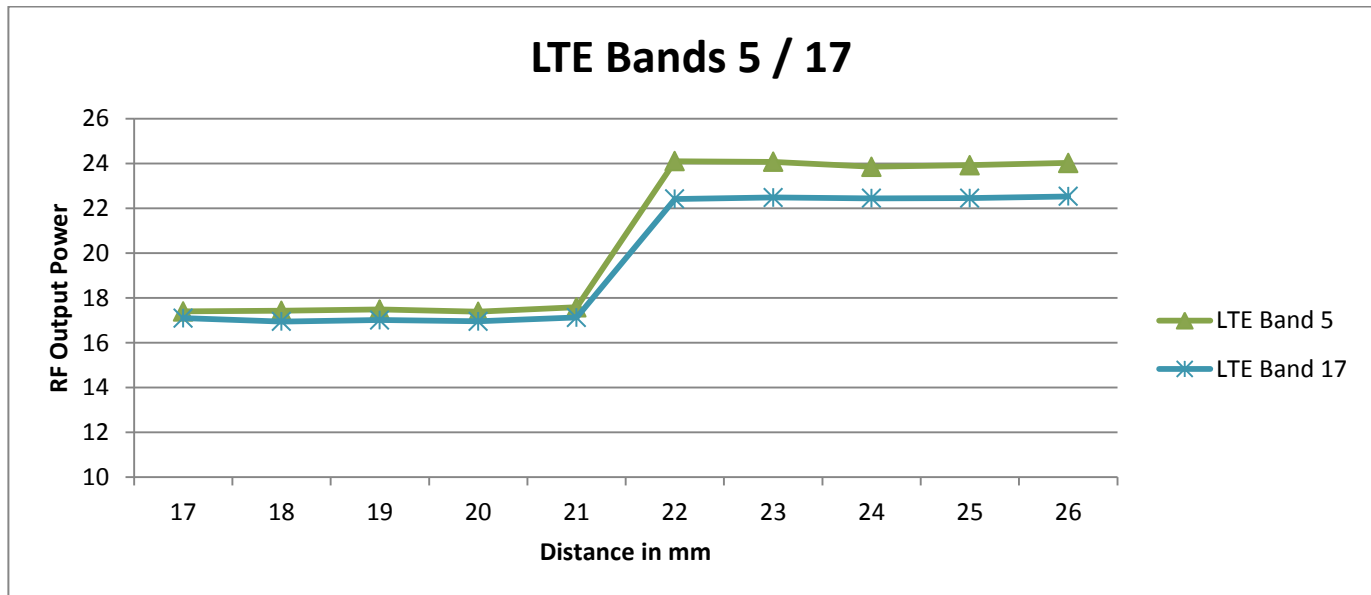
Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance (mm)	11	12	13	14	15	16	17	18	19	20
LTE Band 5	17.7	17.4	17.4	17.5	17.4	23.9	24.1	24.0	24.0	24.1
LTE Band 17	17.0	17.1	17.0	16.9	17.0	22.5	22.5	22.4	22.6	22.5



Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

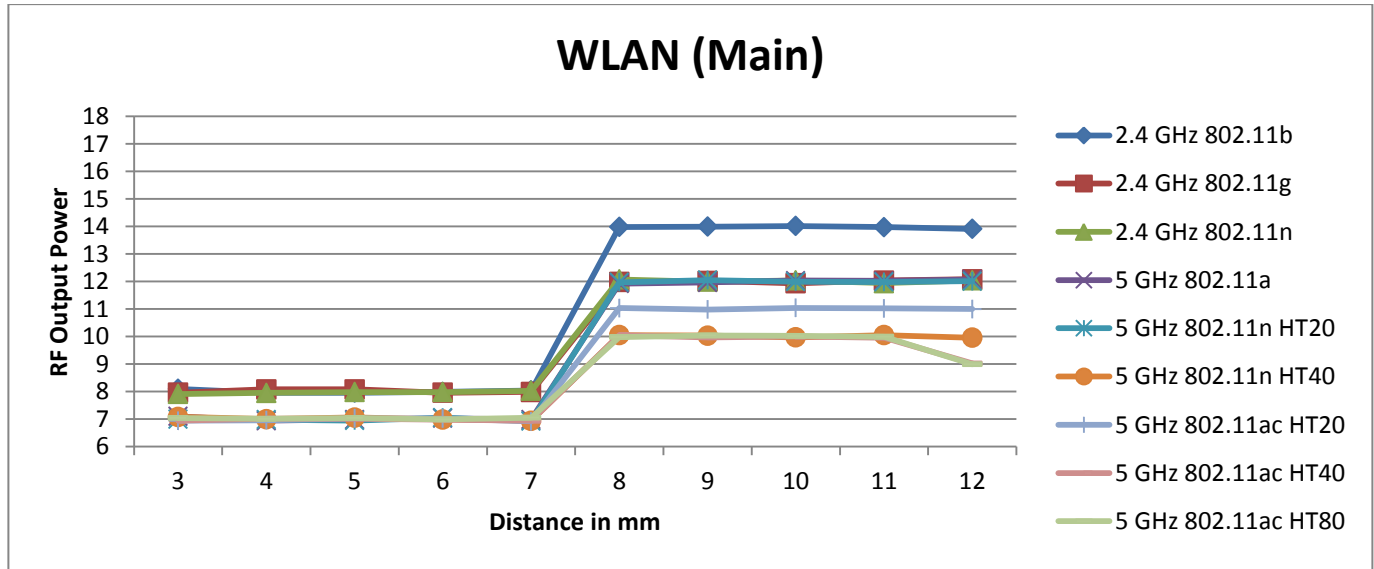
Distance to DUT vs. Output Power in dBm										
Distance (mm)	17	18	19	20	21	22	23	24	25	26
LTE Band 5	17.4	17.4	17.5	17.4	17.6	24.1	24.1	23.9	23.9	24.0
LTE Band 17	17.1	16.9	17.0	17.0	17.1	22.4	22.5	22.4	22.5	22.5



Wi-Fi 2.4GHz and 5GHz (Main)

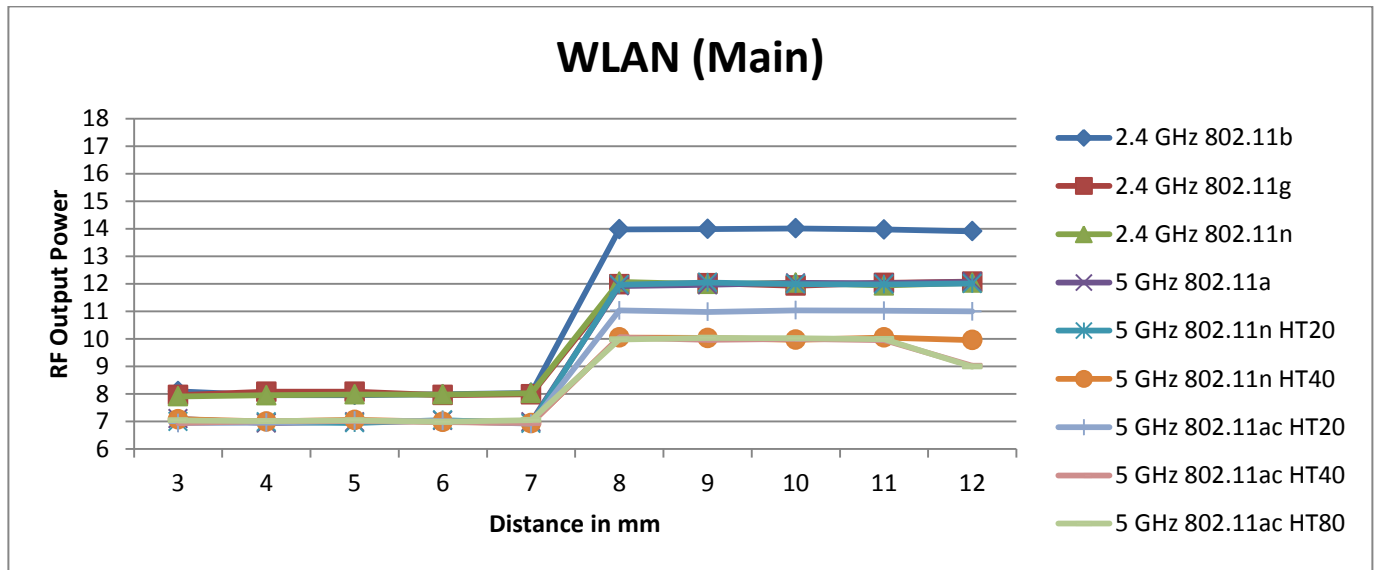
Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

		Distance to DUT vs. Output Power in dBm									
Antenna	Distance	3	4	5	6	7	8	9	10	11	12
Main	2.4 GHz 802.11b	8.1	8.0	8.0	8.0	8.0	14.0	14.0	14.0	14.0	13.9
	2.4 GHz 802.11g	8.0	8.1	8.1	8.0	8.0	12.0	12.0	11.9	12.0	12.1
	2.4 GHz 802.11n	7.9	8.0	8.0	8.0	8.0	12.1	12.0	12.0	11.9	12.0
	5 GHz 802.11a	7.1	6.9	7.0	7.0	7.0	11.9	12.0	12.0	12.0	12.1
	5 GHz 802.11n HT20	7.0	7.0	7.0	7.1	6.9	12.0	12.1	12.0	12.0	12.0
	5 GHz 802.11n HT40	7.1	7.0	7.1	7.0	6.9	10.1	10.0	10.0	10.1	10.0
	5 GHz 802.11ac HT20	6.9	7.0	7.0	7.0	6.9	11.0	11.0	11.0	11.0	11.0
	5 GHz 802.11ac HT40	7.0	7.0	7.0	7.0	6.9	10.1	10.0	10.0	10.0	9.0
	5 GHz 802.11ac HT80	7.0	7.0	7.0	7.0	7.1	10.0	10.0	10.0	10.0	9.0



Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

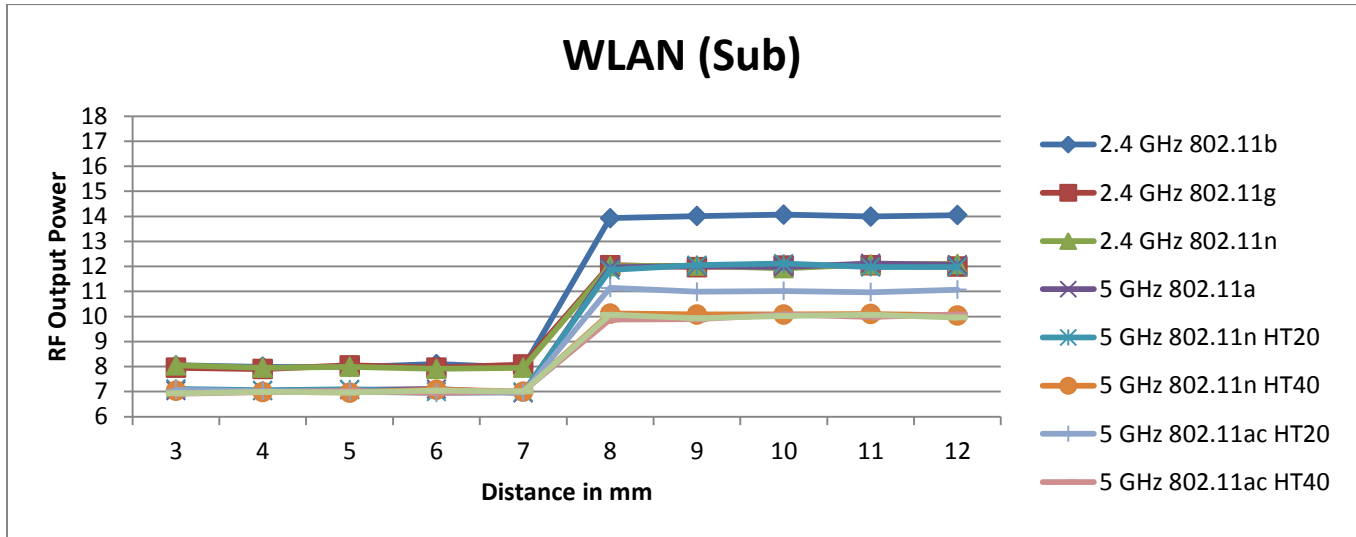
Distance to DUT vs. Output Power in dBm											
Antenna	Distance	3	4	5	6	7	8	9	10	11	12
Main	2.4 GHz 802.11b	8.1	8.0	8.0	8.0	8.0	14.0	14.0	14.0	14.0	13.9
	2.4 GHz 802.11g	8.0	8.1	8.1	8.0	8.0	12.0	12.0	11.9	12.0	12.1
	2.4 GHz 802.11n	7.9	8.0	8.0	8.0	8.0	12.1	12.0	12.0	11.9	12.0
	5 GHz 802.11a	7.1	6.9	7.0	7.0	7.0	11.9	12.0	12.0	12.0	12.1
	5 GHz 802.11n HT20	7.0	7.0	7.0	7.1	6.9	12.0	12.1	12.0	12.0	12.0
	5 GHz 802.11n HT40	7.1	7.0	7.1	7.0	6.9	10.1	10.0	10.0	10.0	10.1
	5 GHz 802.11ac HT20	6.9	7.0	7.0	7.0	6.9	11.0	11.0	11.0	11.0	11.0
	5 GHz 802.11ac HT40	7.0	7.0	7.0	7.0	6.9	10.1	10.0	10.0	10.0	9.0
	5 GHz 802.11ac HT80	7.0	7.0	7.0	7.0	7.1	10.0	10.0	10.0	10.0	9.0



Wi-Fi 2.4GHz and 5GHz (Sub)

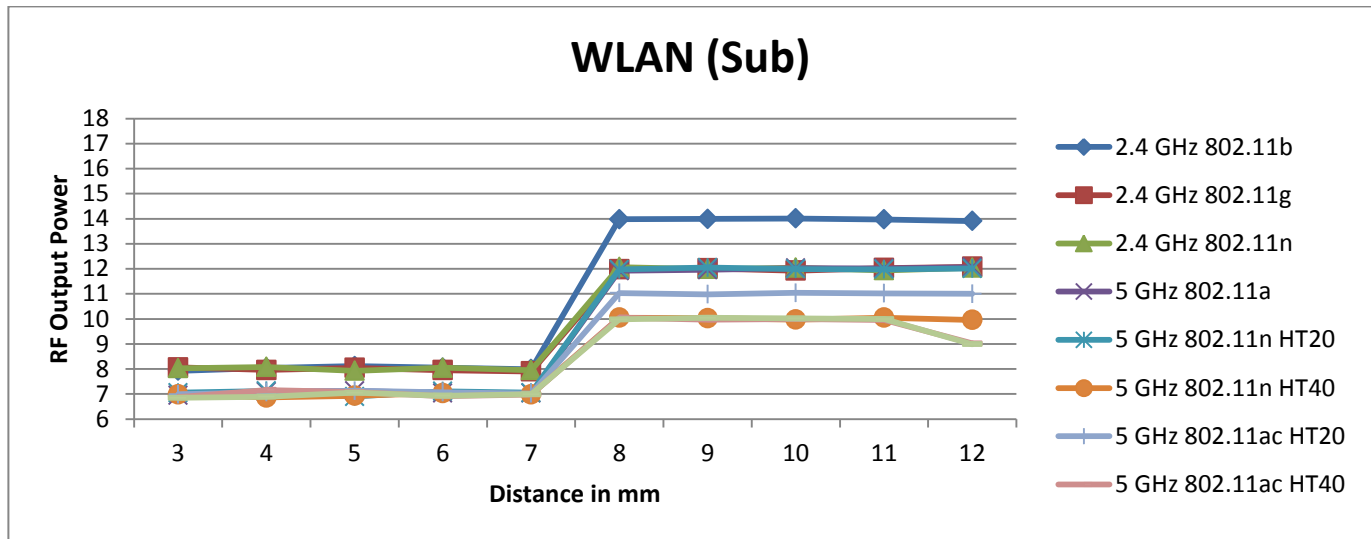
Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm											
Antenna	Distance (mm)	3	4	5	6	7	8	9	10	11	12
Sub	2.4 GHz 802.11b	8.1	8.0	8.0	8.1	8.0	13.9	14.0	14.1	14.0	14.1
	2.4 GHz 802.11g	8.0	7.9	8.1	8.0	8.1	12.1	12.0	12.0	12.0	12.0
	2.4 GHz 802.11n	8.1	8.0	8.0	7.9	8.0	12.0	12.0	11.9	12.1	12.1
	5 GHz 802.11a	7.0	7.0	7.1	7.1	6.9	12.0	12.0	12.0	12.1	12.1
	5 GHz 802.11n HT20	7.1	7.1	7.1	7.0	7.0	11.9	12.1	12.1	12.0	12.0
	5 GHz 802.11n HT40	7.0	7.0	7.0	7.1	7.0	10.1	10.1	10.1	10.1	10.0
	5 GHz 802.11ac HT20	7.1	7.0	7.0	6.9	7.0	11.1	11.0	11.0	11.0	11.1
	5 GHz 802.11ac HT40	6.9	7.0	7.0	7.0	7.0	9.9	9.9	10.1	10.0	10.1
	5 GHz 802.11ac HT80	6.9	7.0	7.0	7.0	7.0	10.1	9.9	10.0	10.1	10.0



Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm											
Antenna	Distance (mm)	3	4	5	6	7	8	9	10	11	12
Sub	2.4 GHz 802.11b	7.9	8.0	8.1	8.1	8.0	14.0	14.0	14.0	14.0	13.9
	2.4 GHz 802.11g	8.1	8.0	8.0	8.0	7.9	12.0	12.0	11.9	12.0	12.1
	2.4 GHz 802.11n	8.0	8.1	7.9	8.1	8.0	12.1	12.0	12.0	11.9	12.0
	5 GHz 802.11a	7.0	7.1	7.1	7.0	7.0	11.9	12.0	12.0	12.0	12.1
	5 GHz 802.11n HT20	7.1	7.1	6.9	7.1	7.1	12.0	12.1	12.0	12.0	12.0
	5 GHz 802.11n HT40	7.0	6.9	6.9	7.0	7.0	10.1	10.0	10.0	10.0	10.0
	5 GHz 802.11ac HT20	7.0	7.1	7.1	7.1	7.0	11.0	11.0	11.0	11.0	11.0
	5 GHz 802.11ac HT40	6.9	7.2	7.1	6.9	7.0	10.1	10.0	10.0	10.0	9.0
	5 GHz 802.11ac HT80	6.9	6.9	7.1	6.9	7.0	10.0	10.0	10.0	10.0	9.0



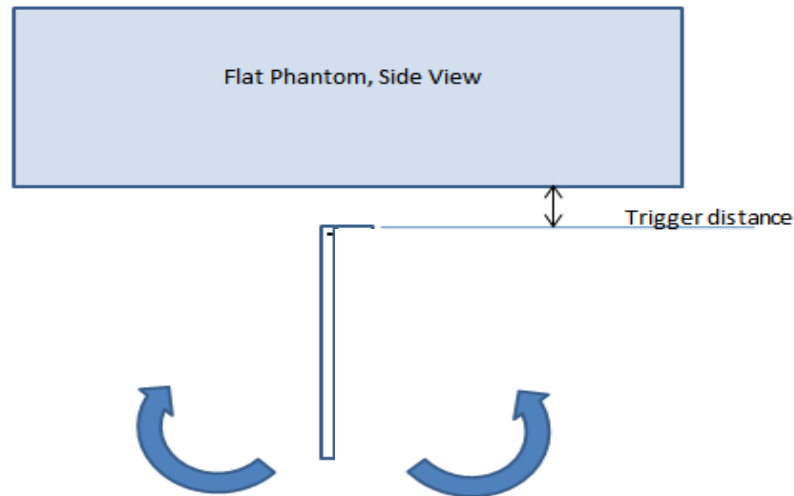
6.6.2. Proximity Sensor Coverage (KDB 616217 §6.3)

As there is no spatial offset between the antenna and the proximity sensor element, proximity sensor coverage did not need to be assessed.

6.6.3. Proximity Sensor Tilt Angle Assessment (KDB 616217 §6.4)

The DUT was positioned directly below the flat phantom at the minimum measured trigger distance with Edge 1 parallel to the base of the flat phantom for each band.

The EUT was rotated about Edge 1 for angles up to +/- 45°. If the output power increased during the rotation the DUT was moved 1mm toward the phantom and the rotation repeated. This procedure was repeated until the power remained reduced for all angles up to +/- 45°.



Proximity sensor tilt angle assessment (Edge 1) KDB 616217 §6.4

Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering

Band (MHz)	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over +/-45°	Power reduction status										
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
750	21 mm	21 mm	On	On	On	On	On	On	On	On	On	On	On
850	21 mm	21 mm	On	On	On	On	On	On	On	On	On	On	On
1900	21 mm	21 mm	On	On	On	On	On	On	On	On	On	On	On
2450	7 mm	7 mm	On	On	On	On	On	On	On	On	On	On	On
5000	7 mm	7 mm	On	On	On	On	On	On	On	On	On	On	On

6.6.4. Resulting test positions for SAR measurements

Wireless technologies	Position	§6.2 Triggering Distance	§6.3 Coverage	§6.4 Tilt Angle	Worst case distance for SAR
WWAN	Rear	15 mm	N/A	N/A	14 mm
	Edge 1	21 mm	N/A	21 mm	20 mm
WLAN	Rear	7 mm	N/A	N/A	6 mm
	Edge 1	7 mm	N/A	7 mm	6 mm

7. RF Exposure Conditions (Test Configurations)

Refer to “SAR Photos and Ant locations” Appendix for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

7.1. Standalone SAR Test Exclusion Considerations

Since the *Dedicated Host Approach* is applied, the standalone SAR test exclusion procedure in KDB 447498 § 4.3.1 is applied in conjunction with KDB 616217 § 4.3 to determine the minimum test separation distance:

- When the separation distance from the antenna to an adjacent edge is ≤ 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
- When the separation distance from the antenna to an adjacent edge is > 5 mm, the actual antenna-to-edge separation distance is applied to determine SAR test exclusion.

SAR Test Exclusion Calculations for WWAN

Antennas < 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off																
Cellular	W-CDMA 5	846.6	23.50	224	2	3.4	193	191	44		41.2 -MEASURE-	41.2 -MEASURE-	> 50 mm	> 50 mm	4.7 -MEASURE-	
Cellular	W-CDMA 2	1907.6	23.00	200	2	3.4	163	191	108		55.2 -MEASURE-	55.2 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	
Cellular	LTE Band 5	844	24.50	282	2	3.4	193	191	44		51.8 -MEASURE-	51.8 -MEASURE-	> 50 mm	> 50 mm	5.9 -MEASURE-	
Cellular	LTE Band 17	710	23.00	200	2	3.4	193	191	44		33.7 -MEASURE-	33.7 -MEASURE-	> 50 mm	> 50 mm	3.8 -MEASURE-	
Power Back-off, Proximity Sensor On																
Cellular	W-CDMA 5	846.6	17.00	50	2	3.4					9.2 -MEASURE-	9.2 -MEASURE-				
Cellular	W-CDMA 2	1907.6	12.50	18	2	3.4					5 -MEASURE-	5 -MEASURE-				
Cellular	LTE Band 5	844	18.00	63	2	3.4					11.6 -MEASURE-	11.6 -MEASURE-				
Cellular	LTE Band 17	710	17.50	56	2	3.4					9.4 -MEASURE-	9.4 -MEASURE-				

Note(s):

According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.

Antennas > 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off																
Cellular	W-CDMA 5	846.6	23.50	224	2	3.4	193	191	44		< 50 mm	< 50 mm	970.1 mW -EXEMPT-	958.8 mW -EXEMPT-	< 50 mm	
Cellular	W-CDMA 2	1907.6	23.00	200	2	3.4	163	191	108		< 50 mm	< 50 mm	1238.6 mW -EXEMPT-	1518.6 mW -EXEMPT-	688.6 mW -EXEMPT-	
Cellular	LTE Band 5	844	24.50	282	2	3.4	193	191	44		< 50 mm	< 50 mm	967.9 mW -EXEMPT-	956.6 mW -EXEMPT-	< 50 mm	
Cellular	LTE Band 17	710	23.00	200	2	3.4	193	191	44		< 50 mm	< 50 mm	854.9 mW -EXEMPT-	845.4 mW -EXEMPT-	< 50 mm	
Power Back-off, Proximity Sensor On																
Cellular	W-CDMA 5	846.6	17.00	50	2	3.4					< 50 mm	< 50 mm				
Cellular	W-CDMA 2	1907.6	12.50	18	2	3.4					< 50 mm	< 50 mm				
Cellular	LTE Band 5	844	18.00	63	2	3.4					< 50 mm	< 50 mm				
Cellular	LTE Band 17	710	17.50	56	2	3.4					< 50 mm	< 50 mm				

Note(s):

According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.

SAR Test Exclusion Calculations for WLAN

Main Antenna < 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Wi-Fi Main Antenna Max Power															
Wi-Fi 2.4 GHz	2462	14.50	28	3.1	3.4	81	188.5	196.2		8.8 -MEASURE-	8.8 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi 5.3 GHz	5320	12.50	18	3.1	3.4	81	188.5	196.2		8.3 -MEASURE-	8.3 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi 5.5 GHz	5700	12.50	18	3.1	3.4	81	188.5	196.2		8.6 -MEASURE-	8.6 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi 5.8 GHz	5825	12.50	18	3.1	3.4	81	188.5	196.2		8.7 -MEASURE-	8.7 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	
Bluetooth	2480	10.00	10	3.1	3.4	81	188.5	196.2		3.1 -MEASURE-	3.1 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi Main Antenna Reduced Power															
Wi-Fi 2.4 GHz	2462	8.50	7	3.1	3.4					2.2 -EXEMPT-	2.2 -EXEMPT-				
Wi-Fi 5.3 GHz	5320	7.50	6	3.1	3.4					2.8 -EXEMPT-	2.8 -EXEMPT-				
Wi-Fi 5.5 GHz	5700	7.50	6	3.1	3.4					2.9 -EXEMPT-	2.9 -EXEMPT-				
Wi-Fi 5.8 GHz	5825	7.50	6	3.1	3.4					2.9 -EXEMPT-	2.9 -EXEMPT-				

Sub Antenna < 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Wi-Fi Sub Antenna Max Power															
Wi-Fi 2.4 GHz	2462	14.50	28	3.1	3.4	95.5	188.5	177		8.8 -MEASURE-	8.8 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi 5.3 GHz	5320	12.50	18	3.1	3.4	95.5	188.5	177		8.3 -MEASURE-	8.3 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi 5.5 GHz	5700	12.50	18	3.1	3.4	95.5	188.5	177		8.6 -MEASURE-	8.6 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi 5.8 GHz	5825	12.50	18	3.1	3.4	95.5	188.5	177		8.7 -MEASURE-	8.7 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi Sub Antenna Reduced Power															
Wi-Fi 2.4 GHz	2462	8.50	7	3.1	3.4					2.2 -EXEMPT-	2.2 -EXEMPT-				
Wi-Fi 5.3 GHz	5320	7.50	6	3.1	3.4					2.8 -EXEMPT-	2.8 -EXEMPT-				
Wi-Fi 5.5 GHz	5700	7.50	6	3.1	3.4					2.9 -EXEMPT-	2.9 -EXEMPT-				
Wi-Fi 5.8 GHz	5825	7.50	6	3.1	3.4					2.9 -EXEMPT-	2.9 -EXEMPT-				

Note(s):

According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.

Main Antennas > 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Wi-Fi Main Antenna Max Power															
Wi-Fi 2.4 GHz	2462	14.50	28	3.1	3.4	81	188.5	196.2		< 50 mm	< 50 mm	405.6 mW -EXEMPT-	1480.6 mW -EXEMPT-	1557.6 mW -EXEMPT-	
Wi-Fi 5.3 GHz	5320	12.50	18	3.1	3.4	81	188.5	196.2		< 50 mm	< 50 mm	375 mW -EXEMPT-	1450 mW -EXEMPT-	1527 mW -EXEMPT-	
Wi-Fi 5.5 GHz	5700	12.50	18	3.1	3.4	81	188.5	196.2		< 50 mm	< 50 mm	372.8 mW -EXEMPT-	1447.8 mW -EXEMPT-	1524.8 mW -EXEMPT-	
Wi-Fi 5.8 GHz	5825	12.50	18	3.1	3.4	81	188.5	196.2		< 50 mm	< 50 mm	372.2 mW -EXEMPT-	1447.2 mW -EXEMPT-	1524.2 mW -EXEMPT-	
Bluetooth	2480	10.00	10	3.1	3.4	81	188.5	196.2		< 50 mm	< 50 mm	405.3 mW -EXEMPT-	1480.3 mW -EXEMPT-	1557.3 mW -EXEMPT-	
Wi-Fi Main Antenna Reduced Power															
Wi-Fi 2.4 GHz	2462	8.50	7	3.1	3.4					< 50 mm	< 50 mm				
Wi-Fi 5.3 GHz	5320	7.50	6	3.1	3.4					< 50 mm	< 50 mm				
Wi-Fi 5.5 GHz	5700	7.50	6	3.1	3.4					< 50 mm	< 50 mm				
Wi-Fi 5.8 GHz	5825	7.50	6	3.1	3.4					< 50 mm	< 50 mm				

Sub Antennas > 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Wi-Fi Sub Antenna Max Power															
Wi-Fi 2.4 GHz	2462	14.50	28	3.1	3.4	95.5	188.5	177		< 50 mm	< 50 mm	550.6 mW -EXEMPT-	1480.6 mW -EXEMPT-	1365.6 mW -EXEMPT-	
Wi-Fi 5.3 GHz	5320	12.50	18	3.1	3.4	95.5	188.5	177		< 50 mm	< 50 mm	520 mW -EXEMPT-	1450 mW -EXEMPT-	1335 mW -EXEMPT-	
Wi-Fi 5.5 GHz	5700	12.50	18	3.1	3.4	95.5	188.5	177		< 50 mm	< 50 mm	517.8 mW -EXEMPT-	1447.8 mW -EXEMPT-	1332.8 mW -EXEMPT-	
Wi-Fi 5.8 GHz	5825	12.50	18	3.1	3.4	95.5	188.5	177		< 50 mm	< 50 mm	517.2 mW -EXEMPT-	1447.2 mW -EXEMPT-	1332.2 mW -EXEMPT-	
Wi-Fi Sub Antenna Reduced Power															
Wi-Fi 2.4 GHz	2462	8.50	7	3.1	3.4					< 50 mm	< 50 mm				
Wi-Fi 5.3 GHz	5320	7.50	6	3.1	3.4					< 50 mm	< 50 mm				
Wi-Fi 5.5 GHz	5700	7.50	6	3.1	3.4					< 50 mm	< 50 mm				
Wi-Fi 5.8 GHz	5825	7.50	6	3.1	3.4					< 50 mm	< 50 mm				

Note(s):

According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.

7.2. Required Test Configurations

The table below identifies the standalone test configurations required for this device according to the findings in Section 7.1:

Test Configurations	Pwr Back-off	Rear	Edge 1	Edge 2	Edge 3	Edge 4
			(Top Edge)	(Right Edge)	(Bottom Edge)	(Left Edge)
WCDMA Band II	Off	Yes	Yes	No	No	No
	On	Yes	Yes	No	No	No
WCDMA Band V	Off	Yes	Yes	No	No	Yes
	On	Yes	Yes	No	No	No
LTE Band 5	Off	Yes	Yes	No	No	Yes
	On	Yes	Yes	No	No	No
LTE Band 17	Off	Yes	Yes	No	No	Yes
	On	Yes	Yes	No	No	No
Wi-Fi 2.4 GHz SISO (Main Antenna)	Off	Yes	Yes	No	No	No
	On	Yes	Yes	No	No	No
Wi-Fi 2.4 GHz SISO (Sub Antenna)	Off	Yes	Yes	No	No	No
	On	Yes	Yes	No	No	No
Wi-Fi 2.4 GHz (MIMO Antenna)	Off	Yes	Yes	No	No	No
	On	Yes	Yes	No	No	No
Wi-Fi 5 GHz SISO (Main Antenna)	Off	Yes	Yes	No	No	No
	On	Yes	Yes	No	No	No
Wi-Fi 5 GHz SISO (Sub Antenna)	Off	Yes	Yes	No	No	No
	On	Yes	Yes	No	No	No
Wi-Fi 5 GHz (MIMO Antenna)	Off	Yes	Yes	No	No	No
	On	Yes	Yes	No	No	No
Bluetooth	Off	Yes	Yes	No	No	No

Note(s):

1. Yes = Testing is required. No = Testing is not required.
2. For Pwr Back-off modes in DTS, UNII bands, there is not required for SAR testing according to applied SAR test exclusion. But SAR of Pwr Back-off modes in DTS, UNII bands were evaluated with reduce power level at 0 mm since this scenario is more conservative.
3. This device is support keyboard accessory that doesn't have transmitter. So we don't consider to keyboard alone. And For bottom of tablet with keyboard as laptop, Both all antennas to bottom distance is more longer than Edge 3 of tablet. So we don't consider to bottom test about tablet with keyboard.

8. Dielectric Property Measurements & System Check

8.1. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within $\pm 2^\circ\text{C}$ of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	ϵ_r	σ (S/m)	ϵ_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

Dielectric Property Measurements Results:

SAR 1 Room

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
1-16-2017	Body 835	e'	54.5700	Relative Permittivity (ϵ_r):	54.57	55.20	-1.14	5
		e"	20.7200	Conductivity (σ):	0.96	0.97	-0.82	5
	Body 820	e'	54.7100	Relative Permittivity (ϵ_r):	54.71	55.28	-1.03	5
		e"	20.7800	Conductivity (σ):	0.95	0.97	-2.17	5
	Body 850	e'	54.4300	Relative Permittivity (ϵ_r):	54.43	55.16	-1.32	5
		e"	20.6500	Conductivity (σ):	0.98	0.99	-1.13	5
1-19-2017	Body 1900	e'	53.7800	Relative Permittivity (ϵ_r):	53.78	53.30	0.90	5
		e"	14.3700	Conductivity (σ):	1.52	1.52	-0.12	5
	Body 1850	e'	53.9200	Relative Permittivity (ϵ_r):	53.92	53.30	1.16	5
		e"	14.1500	Conductivity (σ):	1.46	1.52	-4.24	5
	Body 1910	e'	53.7400	Relative Permittivity (ϵ_r):	53.74	53.30	0.83	5
		e"	14.4200	Conductivity (σ):	1.53	1.52	0.75	5
1-23-2017	Body 750	e'	57.0400	Relative Permittivity (ϵ_r):	57.04	55.55	2.69	5
		e"	22.9500	Conductivity (σ):	0.96	0.96	-0.62	5
	Body 700	e'	57.4900	Relative Permittivity (ϵ_r):	57.49	55.74	3.14	5
		e"	23.4400	Conductivity (σ):	0.91	0.96	-4.89	5
	Body 790	e'	56.6700	Relative Permittivity (ϵ_r):	56.67	55.39	2.31	5
		e"	22.5800	Conductivity (σ):	0.99	0.97	2.66	5
1-23-2017	Body 835	e'	55.0100	Relative Permittivity (ϵ_r):	55.01	55.20	-0.34	5
		e"	20.9600	Conductivity (σ):	0.97	0.97	0.32	5
	Body 820	e'	55.1400	Relative Permittivity (ϵ_r):	55.14	55.28	-0.25	5
		e"	21.0600	Conductivity (σ):	0.96	0.97	-0.85	5
	Body 850	e'	54.8900	Relative Permittivity (ϵ_r):	54.89	55.16	-0.48	5
		e"	20.8900	Conductivity (σ):	0.99	0.99	0.02	5
2-6-2017	Body 2450	e'	51.8800	Relative Permittivity (ϵ_r):	51.88	52.70	-1.56	5
		e"	14.7100	Conductivity (σ):	2.00	1.95	2.76	5
	Body 2410	e'	51.9800	Relative Permittivity (ϵ_r):	51.98	52.76	-1.48	5
		e"	14.6300	Conductivity (σ):	1.96	1.91	2.78	5
	Body 2475	e'	51.8200	Relative Permittivity (ϵ_r):	51.82	52.67	-1.61	5
		e"	14.7700	Conductivity (σ):	2.03	1.99	2.39	5

SAR 2 Room

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
1-20-2017	Body 2450	e'	51.7700	Relative Permittivity (ϵ_r):	51.77	52.70	-1.76	5
		e"	14.6400	Conductivity (σ):	1.99	1.95	2.28	5
	Body 2410	e'	51.8700	Relative Permittivity (ϵ_r):	51.87	52.76	-1.69	5
		e"	14.5600	Conductivity (σ):	1.95	1.91	2.29	5
	Body 2475	e'	51.7200	Relative Permittivity (ϵ_r):	51.72	52.67	-1.80	5
		e"	14.7100	Conductivity (σ):	2.02	1.99	1.98	5
2-2-2017	Body 5180	e'	48.1000	Relative Permittivity (ϵ_r):	48.10	49.05	-1.93	5
		e"	17.6700	Conductivity (σ):	5.09	5.27	-3.45	5
	Body 5300	e'	47.9200	Relative Permittivity (ϵ_r):	47.92	48.88	-1.97	5
		e"	17.7792	Conductivity (σ):	5.24	5.41	-3.18	5
	Body 5600	e'	47.4800	Relative Permittivity (ϵ_r):	47.48	48.48	-2.06	5
		e"	18.0400	Conductivity (σ):	5.62	5.76	-2.50	5
	Body 5800	e'	47.2100	Relative Permittivity (ϵ_r):	47.21	48.20	-2.05	5
		e"	18.2300	Conductivity (σ):	5.88	6.00	-2.01	5
	Body 5825	e'	47.1600	Relative Permittivity (ϵ_r):	47.16	48.20	-2.16	5
		e"	18.2600	Conductivity (σ):	5.91	6.00	-1.43	5

SAR 3 Room

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
1-11-2017	Body 1900	e'	52.8200	Relative Permittivity (ϵ_r):	52.82	53.30	-0.90	5
		e"	14.8300	Conductivity (σ):	1.57	1.52	3.07	5
	Body 1850	e'	52.9500	Relative Permittivity (ϵ_r):	52.95	53.30	-0.66	5
		e"	14.7700	Conductivity (σ):	1.52	1.52	-0.04	5
	Body 1910	e'	52.7900	Relative Permittivity (ϵ_r):	52.79	53.30	-0.96	5
		e"	14.8400	Conductivity (σ):	1.58	1.52	3.69	5
2-6-2017	Body 5180	e'	48.1500	Relative Permittivity (ϵ_r):	48.15	49.05	-1.83	5
		e"	17.9600	Conductivity (σ):	5.17	5.27	-1.87	5
	Body 5300	e'	47.9600	Relative Permittivity (ϵ_r):	47.96	48.88	-1.89	5
		e"	18.0600	Conductivity (σ):	5.32	5.41	-1.65	5
	Body 5600	e'	47.5000	Relative Permittivity (ϵ_r):	47.50	48.48	-2.02	5
		e"	18.3300	Conductivity (σ):	5.71	5.76	-0.93	5
	Body 5800	e'	47.2200	Relative Permittivity (ϵ_r):	47.22	48.20	-2.03	5
		e"	18.5300	Conductivity (σ):	5.98	6.00	-0.40	5
	Body 5825	e'	47.1700	Relative Permittivity (ϵ_r):	47.17	48.20	-2.14	5
		e"	18.5600	Conductivity (σ):	6.01	6.00	0.19	5
2-11-2017	Body 5180	e'	48.2800	Relative Permittivity (ϵ_r):	48.28	49.05	-1.56	5
		e"	18.1400	Conductivity (σ):	5.22	5.27	-0.88	5
	Body 5300	e'	48.0800	Relative Permittivity (ϵ_r):	48.08	48.88	-1.64	5
		e"	18.2600	Conductivity (σ):	5.38	5.41	-0.56	5
	Body 5600	e'	47.6100	Relative Permittivity (ϵ_r):	47.61	48.48	-1.79	5
		e"	18.5700	Conductivity (σ):	5.78	5.76	0.37	5
	Body 5800	e'	47.3000	Relative Permittivity (ϵ_r):	47.30	48.20	-1.87	5
		e"	18.7900	Conductivity (σ):	6.06	6.00	1.00	5
	Body 5825	e'	47.2500	Relative Permittivity (ϵ_r):	47.25	48.20	-1.97	5
		e"	18.8300	Conductivity (σ):	6.10	6.00	1.65	5
2-14-2017	Body 5180	e'	47.6100	Relative Permittivity (ϵ_r):	47.61	49.05	-2.93	5
		e"	18.0900	Conductivity (σ):	5.21	5.27	-1.16	5
	Body 5300	e'	47.4000	Relative Permittivity (ϵ_r):	47.40	48.88	-3.04	5
		e"	18.2000	Conductivity (σ):	5.36	5.41	-0.88	5
	Body 5600	e'	46.9000	Relative Permittivity (ϵ_r):	46.90	48.48	-3.25	5
		e"	18.4800	Conductivity (σ):	5.75	5.76	-0.12	5
	Body 5800	e'	46.6200	Relative Permittivity (ϵ_r):	46.62	48.20	-3.28	5
		e"	18.6600	Conductivity (σ):	6.02	6.00	0.30	5
	Body 5825	e'	46.5600	Relative Permittivity (ϵ_r):	46.56	48.20	-3.40	5
		e"	18.6900	Conductivity (σ):	6.05	6.00	0.89	5

8.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.
For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

Reference Target SAR Values

The reference SAR values can be obtained from the calibration certificate of system validation dipoles

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (W/kg)		
				1g/10g	Head	Body
D750V3	1122	8-30-2016	750	1g	8.32	8.69
				10g	5.41	5.72
D835V2	4d194	7-20-2016	835	1g	9.52	9.65
				10g	6.22	6.28
D1900V2	5d199	2-19-2016	1900	1g	39.80	39.50
				10g	20.70	20.90
D2450V2	939	9-23-2016	2450	1g	52.10	49.90
				10g	24.40	23.70
D5GHzV2	1184	9-1-2016	5300	1g	82.20	75.90
				10g	23.50	21.40
D5GHzV2	1184	9-1-2016	5600	1g	81.80	78.10
				10g	23.30	21.90
D5GHzV2	1184	9-1-2016	5800	1g	78.30	75.60
				10g	22.30	21.00

System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

SAR 1 Room

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta $\pm 10\%$	Plot No.	
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W				
1-16-2017	D835V2	4d194	Body	1g	0.98	9.81	9.65	1.66	
				10g	0.65	6.45	6.28	2.71	
1-19-2017	D1900V2	5d199	Body	1g	4.22	42.20	39.50	6.84	1,2
				10g	2.18	21.80	20.90	4.31	
1-23-2017	D750V2	1122	Body	1g	0.85	8.51	8.69	-2.07	3,4
				10g	0.57	5.66	5.72	-1.05	
1-23-2017	D835V2	4d194	Body	1g	0.99	9.87	9.65	2.28	5,6
				10g	0.65	6.49	6.28	3.34	
2-6-2016	D2450V2	939	Body	1g	5.06	50.60	49.90	1.40	
				10g	2.30	23.00	23.70	-2.95	

SAR 2 Room

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta $\pm 10\%$	Plot No.	
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W				
1-20-2017	D2450V2	939	Body	1g	5.42	54.20	49.90	8.62	7,8
				10g	2.47	24.70	23.70	4.22	
2-2-2017	D5GHzV2 (5300)	1184	Body	1g	7.58	75.80	75.90	-0.13	
				10g	2.10	21.00	21.40	-1.87	
2-2-2017	D5GHzV2 (5600)	1184	Body	1g	8.10	81.00	78.10	3.71	
				10g	2.23	22.30	21.90	1.83	
2-2-2017	D5GHzV2 (5800)	1184	Body	1g	7.72	77.20	75.60	2.12	
				10g	2.11	21.10	21.00	0.48	

SAR 3 Room

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta $\pm 10\%$	Plot No.	
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W				
1-11-2017	D1900V2	5d199	Body	1g	4.07	40.70	39.50	3.04	
				10g	2.09	20.90	20.90	0.00	
2-6-2017	D5GHzV2 (5300)	1184	Body	1g	7.34	73.40	75.90	-3.29	
				10g	2.03	20.30	21.40	-5.14	
2-6-2017	D5GHzV2 (5600)	1184	Body	1g	7.76	77.60	78.10	-0.64	
				10g	2.13	21.30	21.90	-2.74	
2-6-2017	D5GHzV2 (5800)	1184	Body	1g	7.17	71.70	75.60	-5.16	
				10g	1.98	19.80	21.00	-5.71	
2-11-2017	D5GHzV2 (5300)	1184	Body	1g	7.45	74.50	75.90	-1.84	
				10g	2.06	20.60	21.40	-3.74	
2-11-2017	D5GHzV2 (5600)	1184	Body	1g	8.24	82.40	78.10	5.51	
				10g	2.28	22.80	21.90	4.11	
2-11-2017	D5GHzV2 (5800)	1184	Body	1g	7.21	72.10	75.60	-4.63	
				10g	1.98	19.80	21.00	-5.71	
2-14-2017	D5GHzV2 (5300)	1184	Body	1g	7.75	77.50	75.90	2.11	
				10g	2.14	21.40	21.40	0.00	
2-14-2017	D5GHzV2 (5600)	1184	Body	1g	8.41	84.10	78.10	7.68	9,10
				10g	2.31	23.10	21.90	5.48	
2-14-2017	D5GHzV2 (5800)	1184	Body	1g	7.57	75.70	75.60	0.13	
				10g	2.09	20.90	21.00	-0.48	

9. Conducted Output Power Measurements

9.1. W-CDMA

Release 99 Setup Procedures used to establish the test signals

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 2
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	β_c/β_d	8/15

HSDPA Setup Procedures used to establish the test signals

The following 4 Sub-tests were completed according to Release 5 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set 1			
	Power Control Algorithm	Algorithm 2			
	β_c	2/15	11/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	β_c/β_d	2/15	11/15	15/8	15/4
β_{hs}	4/15	24/15	30/15	30/15	
MPR (dB)	0	0	0.5	0.5	
HSDPA Specific Settings	D_{ACK}	8			
	D_{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
A _{hs} = β_{hs}/β_c	30/15				

HSPA (HSDPA & HSUPA) Setup Procedures used to establish the test signals

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSPA				
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2 kbps RMC				
	HSDPA FRC	H-Set 1				
	HSUPA Test	HSPA				
	Power Control Algorithm	Algorithm 2				Algorithm 1
	β_c	11/15	6/15	15/15	2/15	15/15
	β_d	15/15	15/15	9/15	15/15	0
	β_{ec}	209/225	12/15	30/15	2/15	5/15
	β_c/β_d	11/15	6/15	15/9	2/15	15/1
	β_{hs}	22/15	12/15	30/15	4/15	5/15
	β_{ed}	1309/225	94/75	47/15	56/75	47/15
CM (dB)	1	3	2	3	1	
MPR (dB)	0	2	1	2	0	
HSDPA Specific Settings	DACK	8				0
	DNAK	8				0
	DCQI	8				0
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
A _{hs} = β_{hs}/β_c	30/15					
HSUPA Specific Settings	E-DPDCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E-TFCIs	5	5	2	5	1
	Reference E-TFCI	11	11	11	11	67
	Reference E-TFCI PO	4	4	4	4	18
	Reference E-TFCI	67	67	92	67	67
	Reference E-TFCI PO	18	18	18	18	18
	Reference E-TFCI	71	71	71	71	71
	Reference E-TFCI PO	23	23	23	23	23
	Reference E-TFCI	75	75	75	75	75
	Reference E-TFCI PO	26	26	26	26	26
	Reference E-TFCI	81	81	81	81	81
Reference E-TFCI PO	27	27	27	27	27	
Maximum Channelization Codes	2xSF2				SF4	

DC-HSDPA Setup Procedures used to establish the test signals

The following tests were completed according to procedures in section 7.3.13 of 3GPP TS34.108 v9.5.0. A summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0

Table E.5.0: Levels for HSDPA connection setup

Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH_Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13

The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table. Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

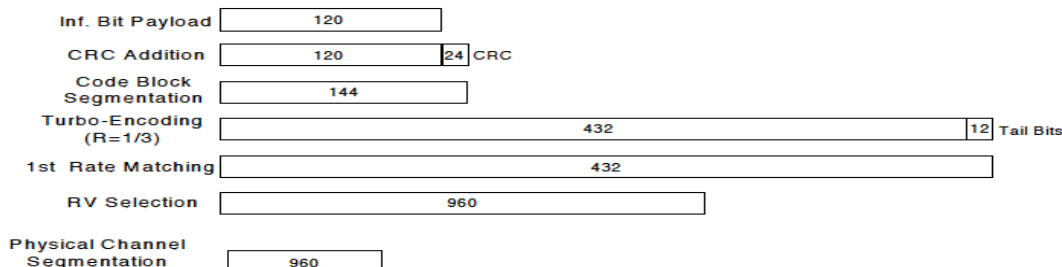


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

The following 4 Sub-tests for HSDPA were completed according to Release 8 procedures in section 5.2 of 3GPP TS34.121. A summary of subtest settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set 1			
	Power Control Algorithm	Algorithm2			
	β_c	2/15	11/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	β_d (SF)	64			
	β_c/β_d	2/15	11/15	15/8	15/4
	β_{hs}	4/15	24/15	30/15	30/15
MPR (dB)	0	0	0.5	0.5	
HSDPA Specific Settings	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack Repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
A _{hs} = β_{hs}/β_c	30/15				

HSPA+

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., Rel. 7 Therefore, the RF conducted power is not measured.

W-CDMA Band II Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	Max. Pwr		Reduction Pwr	
					MPR (dB)	Avg. Pwr (dBm)	MPR (dB)	Avg. Pwr (dBm)
W-CDMA Band II	Rel 99	RMC, 12.2 kbps	9262	1852.4	0	22.2	0	12.2
			9400	1880.0	0	21.9	0	12.0
			9538	1907.6	0	22.0	0	12.1
	HSDPA	Subtest 1	9262	1852.4	0	22.2	0	12.0
			9400	1880.0	0	21.8	0	11.9
			9538	1907.6	0	21.9	0	12.0
		Subtest 2	9262	1852.4	0	22.0	0	12.3
			9400	1880.0	0	21.7	0	12.0
			9538	1907.6	0	21.9	0	12.1
		Subtest 3	9262	1852.4	0.5	21.8	0	12.3
			9400	1880.0	0.5	21.5	0	12.0
			9538	1907.6	0.5	21.5	0	12.1
		Subtest 4	9262	1852.4	0.5	21.6	0	12.3
			9400	1880.0	0.5	21.3	0	12.1
			9538	1907.6	0.5	21.3	0	12.2
	HSUPA	Subtest 1	9262	1852.4	0	21.8	0	11.6
			9400	1880.0	0	21.6	0	11.2
			9538	1907.6	0	21.7	0	11.3
		Subtest 2	9262	1852.4	2	20.4	0	11.7
			9400	1880.0	2	20.1	0	11.4
			9538	1907.6	2	20.2	0	11.5
		Subtest 3	9262	1852.4	1	21.0	0	12.0
			9400	1880.0	1	20.8	0	11.7
			9538	1907.6	1	20.9	0	11.7
		Subtest 4	9262	1852.4	2	20.4	0	11.5
			9400	1880.0	2	20.1	0	11.3
			9538	1907.6	2	20.2	0	11.9
		Subtest 5	9262	1852.4	0	22.1	0	12.4
			9400	1880.0	0	21.8	0	12.1
			9538	1907.6	0	21.9	0	12.1
	DC-HSDPA	Subtest 1	9262	1852.4	0	21.7	0	11.7
			9400	1880.0	0	21.6	0	11.8
			9538	1907.6	0	21.9	0	11.9
		Subtest 2	9262	1852.4	2	22.0	0	12.3
			9400	1880.0	2	21.8	0	12.0
			9538	1907.6	2	21.8	0	12.1
		Subtest 3	9262	1852.4	1	21.8	0	12.3
			9400	1880.0	1	21.5	0	12.1
			9538	1907.6	1	21.5	0	12.2
		Subtest 4	9262	1852.4	2	21.6	0	12.4
			9400	1880.0	2	21.2	0	12.1
			9538	1907.6	2	21.3	0	12.2

W-CDMA Band V Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	Max. Pwr		Reduction Pwr	
					MPR (dB)	Avg. Pwr (dBm)	MPR (dB)	Avg. Pwr (dBm)
W-CDMA Band V	Rel 99	RMC, 12.2 kbps	4132	826.4	0	22.5	0	16.4
			4183	836.6	0	22.5	0	16.3
			4233	846.6	0	22.3	0	16.2
	HSDPA	Subtest 1	4132	826.4	0	22.5	0	16.2
			4183	836.6	0	22.3	0	16.2
			4233	846.6	0	22.2	0	16.0
		Subtest 2	4132	826.4	0	22.3	0	16.4
			4183	836.6	0	22.2	0	16.4
			4233	846.6	0	22.1	0	16.2
		Subtest 3	4132	826.4	0.5	22.0	0	16.5
			4183	836.6	0.5	22.0	0	16.4
			4233	846.6	0.5	21.8	0	16.2
		Subtest 4	4132	826.4	0.5	21.8	0	16.4
			4183	836.6	0.5	21.7	0	16.4
			4233	846.6	0.5	21.6	0	16.2
	HSUPA	Subtest 1	4132	826.4	0	21.5	0	15.7
			4183	836.6	0	21.4	0	15.7
			4233	846.6	0	21.3	0	15.4
		Subtest 2	4132	826.4	2	20.6	0	15.9
			4183	836.6	2	20.5	0	15.9
			4233	846.6	2	20.3	0	15.7
		Subtest 3	4132	826.4	1	21.3	0	15.9
			4183	836.6	1	21.3	0	15.8
			4233	846.6	1	21.1	0	15.7
		Subtest 4	4132	826.4	2	20.9	0	15.7
			4183	836.6	2	20.9	0	15.6
			4233	846.6	2	20.8	0	15.5
		Subtest 5	4132	826.4	0	22.4	0	16.5
			4183	836.6	0	22.3	0	16.4
			4233	846.6	0	22.1	0	16.3
	DC-HSDPA	Subtest 1	4132	826.4	0	22.2	0	16.0
			4183	836.6	0	22.3	0	16.1
			4233	846.6	0	22.0	0	16.0
		Subtest 2	4132	826.4	2	22.2	0	16.5
			4183	836.6	2	22.1	0	16.4
			4233	846.6	2	22.0	0	16.2
Subtest 3		4132	826.4	1	21.9	0	16.5	
		4183	836.6	1	21.9	0	16.4	
		4233	846.6	1	21.8	0	16.2	
Subtest 4		4132	826.4	2	21.7	0	16.4	
		4183	836.6	2	21.7	0	16.4	
		4233	846.6	2	21.6	0	16.2	

9.2. LTE

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of "NS_01".

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4, 10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3	13	10	Table 6.2.4-2	Table 6.2.4-2
	6.6.3.3.2				
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23 ¹	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-

Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.

LTE Band 5 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Reduction Avg Pwr (dBm)		
						829 MHz	836.5 MHz	844 MHz	829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0		23.6			17.5	
			1	25	0		23.5			17.3	
			1	49	0		23.4			17.3	
			25	0	1		22.3			16.0	
			25	12	1		22.2			15.9	
			25	25	1		22.1			15.8	
		16QAM	1	0	1		23.2			16.9	
			1	25	1		23.0			16.8	
			1	49	1		23.0			16.7	
			25	0	2		20.7			14.5	
			25	12	2		20.6			14.4	
			25	25	2		20.5			14.4	
50	0	2		20.5			14.4				
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Reduction Avg Pwr (dBm)		
						826.5 MHz	836.5 MHz	846.5 MHz	826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	23.5	23.4	23.1	17.4	17.2	17.2
			1	12	0	23.5	23.4	23.2	17.4	17.2	17.3
			1	24	0	23.5	23.2	23.1	17.4	17.1	17.1
			12	0	1	22.4	22.2	22.1	16.0	15.9	15.8
			12	6	1	22.3	22.1	22.0	16.0	15.8	15.7
			12	11	1	22.4	22.1	22.0	16.0	15.9	15.7
			25	0	1	22.3	22.2	22.1	16.0	15.8	15.7
		16QAM	1	0	1	22.8	22.9	23.3	16.5	16.4	16.6
			1	12	1	22.8	22.9	23.3	16.5	16.4	16.6
			1	24	1	22.8	22.8	23.2	16.5	16.3	16.5
			12	0	2	20.8	20.8	20.5	14.6	14.5	14.4
			12	6	2	20.8	20.6	20.5	14.6	14.4	14.4
			12	11	2	20.8	20.6	20.5	14.6	14.4	14.4
			25	0	2	20.9	20.5	20.5	14.5	14.5	14.3
			25	0	2	20.9	20.5	20.5	14.5	14.5	14.3
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Reduction Avg Pwr (dBm)		
						825.5 MHz	836.5 MHz	847.5 MHz	825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	23.6	23.7	23.4	17.5	17.5	17.3
			1	7	0	23.7	23.6	23.5	17.6	17.5	17.4
			1	14	0	23.6	23.6	23.4	17.5	17.5	17.3
			8	0	1	22.4	22.3	22.2	16.1	15.9	15.9
			8	4	1	22.4	22.3	22.2	16.1	16.0	15.9
			8	7	1	22.4	22.3	22.2	16.1	16.0	15.9
			15	0	1	22.4	22.3	22.1	16.1	16.0	15.9
		16QAM	1	0	1	22.8	23.2	22.7	16.6	16.9	16.6
			1	7	1	22.9	23.2	22.8	16.6	17.0	16.6
			1	14	1	22.7	23.1	22.7	16.6	16.8	16.5
			8	0	2	20.9	20.6	20.7	14.6	14.4	14.6
			8	4	2	21.0	20.6	20.8	14.7	14.4	14.6
			8	7	2	20.9	20.6	20.9	14.7	14.4	14.7
			15	0	2	20.9	20.7	20.5	14.7	14.5	14.4
			15	0	2	20.9	20.7	20.5	14.7	14.5	14.4

LTE Band 5 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Reduction Avg Pwr (dBm)		
						824.7 MHz	836.5 MHz	848.3 MHz	824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4	QPSK	1	0	0	23.5	23.5	23.5	17.7	17.6	17.4
			1	2	0	23.5	23.5	23.5	17.2	17.1	17.0
			1	5	0	23.5	23.6	23.5	17.7	17.6	17.4
			3	0	0	23.5	23.5	23.4	17.5	17.4	17.3
			3	1	0	23.5	23.5	23.4	17.4	17.3	17.2
			3	2	0	23.5	23.6	23.4	17.4	17.3	17.1
		6	0	1	22.4	22.4	22.1	16.1	15.9	15.8	
		16QAM	1	0	1	22.6	22.7	23.0	16.8	16.9	16.6
			1	2	1	22.7	22.7	23.1	16.3	16.5	16.2
			1	5	1	22.7	22.7	23.1	16.7	16.9	16.6
			3	0	1	23.2	23.2	22.8	16.7	16.7	16.6
			3	1	1	23.2	23.2	22.8	16.5	16.5	16.5
			3	2	1	23.2	23.2	22.8	16.6	16.4	16.4
			6	0	2	21.1	20.5	20.8	14.8	14.3	14.6

Note(s):

10 MHz Bandwidths does not support at least three non-overlapping channels in certain channel bandwidths. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing per KDB 941225 D05 SAR for LTE Devices

LTE Band 17 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)	Target MPR	Reduction Avg Pwr (dBm)
						710 MHz		710 MHz
LTE Band 17	10	QPSK	1	0	0	22.4	0	17.0
			1	25	0	22.2	0	16.8
			1	49	0	22.2	0	16.8
			25	0	1	21.3	1	16.1
			25	12	1	21.2	1	15.9
			25	25	1	21.2	1	15.9
			50	0	1	21.2	1	15.9
		16QAM	1	0	1	21.3	1	16.0
			1	25	1	21.1	1	15.8
			1	49	1	21.1	1	15.7
			25	0	2	20.4	2	15.1
			25	12	2	20.2	2	15.0
			25	25	2	20.2	2	14.9
			50	0	2	20.3	2	15.0
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)	Target MPR	Reduction Avg Pwr (dBm)
						710 MHz		710 MHz
LTE Band 17	5	QPSK	1	0	0	22.3	0	16.7
			1	12	0	22.3	0	16.8
			1	24	0	22.2	0	16.7
			12	0	1	21.3	1	16.0
			12	6	1	21.2	1	15.9
			12	11	1	21.2	1	15.9
			25	0	1	21.2	1	15.9
		16QAM	1	0	1	21.3	1	16.0
			1	12	1	21.2	1	16.0
			1	24	1	21.1	1	15.8
			12	0	2	20.3	2	15.1
			12	6	2	20.2	2	15.0
			12	11	2	20.3	2	15.0
			25	0	2	20.4	2	15.1

Note(s):

10/5 MHz Bandwidths does not support at least three non-overlapping channels in certain channel bandwidths. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing per KDB 941225 D05 SAR for LTE Devices

9.3. Wi-Fi 2.4GHz (DTS Band)

Measured Results

Antenna	Mode	Data Rate	Ch #	Freq. (MHz)	Max. Avg Pwr (dBm)			Reduction Avg Pwr (dBm)			
					Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	
SISO Main	802.11b	1 Mbps	1	2412	14.1	14.5	Yes	7.9	8.5	Yes	
			6	2437	14.1			7.8			
			11	2462	14.1			8.4			
			12	2467	8.0	8.0	8.5				
			13	2472	8.2	8.5					
	802.11g	6 Mbps	1	2412	Not Required	12.5	No	7.8	8.5	No	
			6	2437				8.2			
			11	2462				8.0			
			12	2467		8.5	No	7.5			8.5
			13	2472		3.5		3.2			3.5
	802.11n	6.5 Mbps	1	2412	Not Required	12.5	No	7.7	8.5	No	
			6	2437				8.0			
			11	2462				7.8			
			12	2467		8.5	No	7.6			8.5
			13	2472		2.5		1.6			2.5
SISO Sub	802.11b	1 Mbps	1	2412	14.3	14.5	Yes	8.4	8.5	Yes	
			6	2437	14.1			8.0			
			11	2462	14.2			7.8			
			12	2467	8.3	No	8.3	8.5			
			13	2472	8.0		8.0	8.5			
	802.11g	6 Mbps	1	2412	Not Required	12.5	No	7.8	8.5	No	
			6	2437				7.5			
			11	2462				8.2			
			12	2467		8.5	No	7.8			8.5
			13	2472		3.5		2.7			3.5
	802.11n	6.5 Mbps	1	2412	Not Required	12.5	No	7.5	8.5	No	
			6	2437				8.1			
			11	2462				8.1			
			12	2467		8.5	No	7.5			8.5
			13	2472		2.5		2.4			2.5

Measured Results

Antenna	Mode	Data Rate	Ch #	Freq. (MHz)	Max. Avg Pwr (dBm)			Reduction Avg Pwr (dBm)		
					Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
MIMO Main	802.11n	6.5 Mbps	1	2412	11.6	12.5	Yes	8.3	8.5	Yes
			6	2437	11.6			8.4		
			11	2462	11.6			8.0		
			12	2467	7.8	No	7.8	8.5		
			13	2472	1.1		2.5	1.1		
MIMO Sub	802.11n	6.5 Mbps	1	2412	11.8	12.5	Yes	8.0	8.5	Yes
			6	2437	11.6			8.4		
			11	2462	11.7			8.3		
			12	2467	8.0	No	8.0	8.5		
			13	2472	2.1		2.5	2.1		

Note(s):

- Output Power and SAR is not required for 802.11g/n HT20 channels when the highest *reported* SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

9.4. Wi-Fi 5GHz (U-NII Bands)

Measured Results

Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max. Avg Pwr (dBm)			Reduction Avg Pwr (dBm)		
						Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
SISO Main	5.3 (U-NII 2A)	802.11a	6 Mbps	52	5260	12.4	12.5	Yes	Not Required	7.5	No
				56	5280	12.4					
				60	5300	12.5					
				64	5320	12.5					
		802.11n (HT20)	6.5 Mbps	52	5260	11.8	12.5	No			
				56	5280	11.7					
				60	5300	11.8					
		802.11n (HT40)	13.5 Mbps	54	5270	Not Required	10.5	No			
				62	5310	Not Required					
				64	5320	11.6					
		802.11ac (VHT20)	6.5 Mbps	52	5260	Not Required	11.5	No			
				56	5280						
	60			5300							
	802.11ac (VHT40)	13.5 Mbps	54	5270	Not Required	10.5	No				
			62	5310							
			64	5320							
	802.11ac (VHT80)	29.3 Mbps	58	5290	Not Required	10.5	No	6.9	7.5	Yes	
	5.5 (U-NII 2C)	802.11a	6 Mbps	100	5500	12.3	12.5	Yes	Not Required	7.5	No
				112	5560	12.5					
				116	5580	12.4					
				132	5660	12.5					
				140	5700	12.4					
		802.11n (HT20)	6.5 Mbps	100	5500	11.8	12.5	No			
				112	5560	11.8					
				116	5580	11.7					
				120	5660	11.8					
		802.11n (HT40)	13.5 Mbps	102	5510	Not Required	10.5	No			
				118	5590						
				134	5670						
		802.11ac (VHT20)	6.5 Mbps	100	5500	Not Required	11.5	No			
120				5600							
140				5700							
802.11ac (VHT40)		13.5 Mbps	102	5510	Not Required	10.5	No				
			118	5590							
			134	5670							
802.11ac (VHT80)	29.3 Mbps	106	5530	Not Required	10.5	No	6.7	7.5	Yes		
5.8 (U-NII 3)	802.11a	6 Mbps	149	5745	12.4	12.5	Yes	Not Required	7.5	No	
			157	5785	11.5						
			165	5825	11.6						
	802.11n (HT20)	6.5 Mbps	149	5745	11.8	12.5	No				
			157	5785	11.9						
			165	5825	12.1						
	802.11n (HT40)	13.5 Mbps	151	5755	Not Required	10.5	No				
			159	5795							
	802.11ac (VHT20)	6.5 Mbps	149	5745	Not Required	11.5	No				
			157	5785							
			165	5825							
	802.11ac (VHT40)	13.5 Mbps	151	5755	Not Required	10.5	No				
159			5795								
802.11ac (VHT80)	29.3 Mbps	155	5775	Not Required	10.5	No	6.7	7.5	Yes		

Measured Results(Continued)

Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max. Avg Pwr (dBm)			Reduction Avg Pwr (dBm)		
						Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
SISO Aux	5.3 (U-NII 2A)	802.11a	6 Mbps	52	5260	12.1	12.5	Yes	Not Required	7.5	No
				56	5280	11.7					
				60	5300	11.9					
				64	5320	11.9					
		802.11n (HT20)	6.5 Mbps	52	5260	12.3	12.5	No			
				56	5280	11.9					
				60	5300	12.1					
		802.11n (HT40)	13.5 Mbps	54	5270	Not Required	10.5	No			
				62	5310						
				64	5320						
		802.11ac (VHT20)	6.5 Mbps	52	5260	Not Required	11.5	No			
				56	5280						
	60			5300							
	802.11ac (VHT40)	13.5 Mbps	54	5270	Not Required	10.5	No				
			62	5310							
	802.11ac (VHT80)	29.3 Mbps	58	5290	Not Required	10.5	No	7.0	7.5	Yes	
	5.5 (U-NII 2C)	802.11a	6 Mbps	100	5500	11.7	12.5	Yes	Not Required	7.5	No
				112	5560	12.0					
				116	5580	12.0					
				132	5660	11.8					
				140	5700	11.7					
		802.11n (HT20)	6.5 Mbps	100	5500	12.1	12.5	No			
				112	5560	12.2					
				116	5580	12.2					
				132	5660	12.0					
		802.11n (HT40)	13.5 Mbps	102	5510	Not Required	10.5	No			
				118	5590						
134				5670							
802.11ac (VHT20)		6.5 Mbps	100	5500	Not Required	11.5	No				
			120	5600							
			140	5700							
802.11ac (VHT40)	13.5 Mbps	102	5510	Not Required	10.5	No					
		118	5590								
802.11ac (VHT80)	29.3 Mbps	106	5530	Not Required	10.5	No	6.4	7.5	Yes		
5.8 (U-NII 3)	802.11a	6 Mbps	149	5745	12.5	12.5	Yes	Not Required	7.5	No	
			157	5785	11.7						
			165	5825	11.7						
	802.11n (HT20)	6.5 Mbps	149	5745	11.8	12.5	No				
			157	5785	12.1						
			165	5825	12.0						
	802.11n (HT40)	13.5 Mbps	151	5755	Not Required	10.5	No				
			159	5795							
	802.11ac (VHT20)	6.5 Mbps	149	5745	Not Required	11.5	No				
			157	5785							
			165	5825							
	802.11ac (VHT40)	13.5 Mbps	151	5755	Not Required	10.5	No				
159			5795								
802.11ac (VHT80)	29.3 Mbps	155	5775	Not Required	10.5	No	7.4	7.5	Yes		

Measured Results

Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max. Avg Pwr (dBm)			Reduction Avg Pwr (dBm)				
						Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)		
MIMO Main	5.3 (U-NII 2A)	802.11n (HT20)	6.5 Mbps	52	5260	11.8	12.5	Yes	Not Required	7.5	No		
				56	5280	11.8							
				60	5300	11.8							
				64	5320	11.7							
		802.11n (HT40)	13.5 Mbps	54	5270	Not Required	10.5	No					
				62	5310	Not Required							
		802.11ac (VHT20)	6.5 Mbps	52	5260	Not Required	11.5	No					
				56	5280								
				60	5300								
		802.11ac (VHT40)	13.5 Mbps	54	5270	Not Required	10.5	No					
				62	5310								
		802.11ac (VHT80)	29.3 Mbps	58	5290	Not Required	10.5	No		6.9	7.5	Yes	
		5.5 (U-NII 2C)	802.11n (HT20)	6.5 Mbps	100	5500	11.8	12.5		Yes	Not Required	7.5	No
					112	5560	11.7						
	116				5580	10.9							
	132				5660	11.7							
	140				5700	11.6							
	802.11n (HT40)		13.5 Mbps	102	5510	Not Required	10.5	No					
				118	5590								
				134	5670								
	802.11ac (VHT20)		6.5 Mbps	100	5500	Not Required	11.5	No					
				120	5600								
				140	5700								
	802.11ac (VHT40)		13.5 Mbps	102	5510	Not Required	10.5	No					
				118	5590								
				134	5670								
	802.11ac (VHT80)	29.3 Mbps	106	5530	Not Required	10.5	No	5.9	7.5	Yes			
	5.8 (U-NII 3)	802.11n (HT20)	6.5 Mbps	149	5745	11.8	12.5	Yes	Not Required	7.5	No		
157				5785	11.9								
165				5825	12.2								
802.11n (HT40)		13.5 Mbps	151	5755	Not Required	10.5	No						
			159	5795									
802.11ac (VHT20)		6.5 Mbps	149	5745	Not Required	11.5	No						
			157	5785									
			165	5825									
802.11ac (VHT40)		13.5 Mbps	151	5755	Not Required	10.5	No						
			159	5795									
802.11ac (VHT80)	29.3 Mbps	155	5775	Not Required	10.5	No	6.7	7.5	Yes				

Measured Results(Continued)

Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max. Avg Pwr (dBm)			Reduction Avg Pwr (dBm)		
						Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
MIMO Aux	5.3 (U-NII 2A)	802.11n (HT20)	6.5 Mbps	52	5260	12.4	12.5	Yes	Not Required	7.5	No
				56	5280	12.0					
				60	5300	12.2					
				64	5320	12.2					
		802.11n (HT40)	13.5 Mbps	54	5270	Not Required	10.5	No			
				62	5310	Not Required					
		802.11ac (VHT20)	6.5 Mbps	52	5260	Not Required	11.5	No			
				56	5280						
				60	5300						
		802.11ac (VHT40)	13.5 Mbps	54	5270	Not Required	10.5	No			
				62	5310						
		802.11ac (VHT80)	29.3 Mbps	58	5290	Not Required	10.5	No		7.0	7.5
	5.5 (U-NII 2C)	802.11n (HT20)	6.5 Mbps	100	5500	12.3	12.5	Yes	Not Required	7.5	No
				112	5560	12.3					
				116	5580	11.5					
				120	5660	12.1					
				140	5700	11.9					
		802.11n (HT40)	13.5 Mbps	102	5510	Not Required	10.5	No			
				118	5590						
		802.11ac (VHT20)	6.5 Mbps	100	5500	Not Required	11.5	No			
				120	5600						
				140	5700						
		802.11ac (VHT40)	13.5 Mbps	102	5510	Not Required	10.5	No			
				118	5590						
	802.11ac (VHT80)	29.3 Mbps	106	5530	Not Required	10.5	No	6.7	7.5	Yes	
	5.8 (U-NII 3)	802.11n (HT20)	6.5 Mbps	149	5745	12.0	12.5	Yes	Not Required	7.5	No
				157	5785	12.2					
				165	5825	12.1					
		802.11n (HT40)	13.5 Mbps	151	5755	Not Required	10.5	No			
				159	5795						
802.11ac (VHT20)		6.5 Mbps	149	5745	Not Required	11.5	No				
			157	5785							
802.11ac (VHT40)		13.5 Mbps	151	5755	Not Required	10.5	No				
			159	5795							
802.11ac (VHT80)		29.3 Mbps	155	5775	Not Required	10.5	No	7.4		7.5	Yes

Note(s):

- Output power measurement is required for multiple configurations of the same channel bandwidth that have the same specified maximum output power according to Appendix C in KDB 248227.
- When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/g/n/ac modes, the channel in the lower order/sequence 802.11 mode (i.e. a, g, n then ac) is selected.
- When the specified maximum output power is the same for both UNII band I and UNII band 2A, begin SAR measurement in UNII band 2A; and if the highest reported SAR for UNII band 2A is
 - ≤ 1.2 W/kg, SAR is not required for UNII band I
 - > 1.2 W/kg, both bands should be tested independently for SAR.

9.5. Bluetooth

Band (GHz)	Mode	Ch #	Freq. (MHz)	Avg Pwr (dBm)
2.4	EDR, GFSK	0	2402	9.4
		39	2441	10.0
		78	2480	8.8
	EDR, $\pi/4$ DQPSK	0	2402	6.1
		39	2441	6.7
		78	2480	5.1
	EDR, 8-DPSK	0	2402	6.1
		39	2441	6.8
		78	2480	5.2
	LE, GFSK	0	2402	0.7
		19	2440	2.2
		39	2480	1.4

10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

KDB 447498 D01 General RF Exposure Guidance:

Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

KDB 941225 D01 SAR test for 3G devices:

When the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode

KDB 941225 D05 SAR for LTE Devices:

SAR must be measured with the maximum TTI(transmit time interval) supported by the device in each LTE configuration.

SAR test reduction is applied using the following criteria:

- Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel.
- When the reported SAR is > 0.8 W/kg, testing for other Channels is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
- Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are > 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
- Testing for 16-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
- Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

KDB 248227 D01 SAR meas for 802.11 v02r02:

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the initial test position(s) by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The initial test position(s) is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the reported SAR for the initial test position is:

- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- > 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions are tested.
 - For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
 - When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required test channels are considered.
 - The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.
- When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is ≤ 1.2 W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
- When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is ≤ 1.2 W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

To determine the initial test position, Area Scans were performed to determine the position with the *Maximum Value of SAR (measured)*. The position that produced the highest *Maximum Value of SAR* is considered the worst case position; thus used as the initial test position.

10.1. W-CDMA Band II

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Standalone	Rel 99 RMC	ON	0	Rear	9400	1880.0	12.5	12.0	0.678	0.766	1
				Edge 1	9400	1880.0	12.5	12.0	0.222	0.251	
Standalone	Rel 99 RMC	OFF	14	Rear	9400	1880.0	23.0	21.9	0.557	0.713	
			20	Edge 1	9400	1880.0	23.0	21.9	0.203	0.260	

10.2. W-CDMA Band V

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Standalone	Rel 99 RMC	ON	0	Rear	4183	836.6	17.0	16.3	0.530	0.623	
				Edge 1	4183	836.6	17.0	16.3	0.585	0.688	2
Standalone	Rel 99 RMC	OFF	14	Rear	4183	836.6	23.5	22.5	0.428	0.541	
			20	Edge 1	4183	836.6	23.5	22.5	0.223	0.282	
			0	Edge 4	4183	836.6	23.5	22.5	0.226	0.286	

10.3. LTE Band 5 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
Standalone	QPSK	On	0	Rear	20525	836.5	1	0	18.0	17.5	0.671	0.749	
							25	0	17.0	16.0	0.473	0.593	
				Edge 1	20525	836.5	1	0	18.0	17.5	0.713	0.795	3
							25	0	17.0	16.0	0.507	0.636	
Standalone	QPSK	OFF	14	Rear	20525	836.5	1	0	24.5	23.6	0.544	0.665	
							25	0	23.5	22.3	0.423	0.555	
			20	Edge 1	20525	836.5	1	0	24.5	23.6	0.275	0.336	
							25	0	23.5	22.3	0.212	0.278	
			0	Edge 4	20525	836.5	1	0	24.5	23.6	0.244	0.298	
							25	0	23.5	22.3	0.185	0.243	

10.4. LTE Band 17(10MHz Bandwidth)

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
Standalone	QPSK	On	0	Rear	23790	710.0	1	0	17.5	17.0	0.480	0.541	4
							25	0	16.5	16.1	0.406	0.450	
				Edge 1	23790	710.0	1	0	17.5	17.0	0.459	0.517	
							25	0	16.5	16.1	0.390	0.433	
Standalone	QPSK	OFF	14	Rear	23790	710.0	1	0	23.0	22.4	0.186	0.215	
							25	0	22.0	21.3	0.157	0.184	
			20	Edge 1	23790	710.0	1	0	23.0	22.4	0.049	0.057	
							25	0	22.0	21.3	0.044	0.051	
			0	Edge 4	23790	710.0	1	0	23.0	22.4	0.097	0.113	
							25	0	22.0	21.3	0.081	0.094	

10.5. Wi-Fi (DTS Band)

Mode	Mode	Pwr. Back-off	Dist. (mm)	Antenna	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Note	Plot No.
									Tune-up limit	Meas.	Meas.	Scaled		
Standalone	802.11b 1 Mbps	On	0	SISO Main	Rear	11	2462.0	0.479	8.5	8.4	0.445	0.456		5
				Edge 1	11	2462.0	0.096	8.5	8.4	0.088	0.090	2		
		SISO Sub	Rear	1	2412.0	0.522	8.5	8.4	0.354	0.365	1			
		Edge 1	1	2412.0	0.064	8.5	8.4							
	Off	6	SISO Main	Rear	6	2437.0	0.510	14.5	14.1	0.418	0.456			
			Edge 1	6	2437.0	0.219	14.5	14.1	0.205	0.224	2			
		SISO Sub	Rear	1	2412.0	0.535	14.5	14.3	0.373	0.395	1			
		Edge 1	1	2412.0	0.134	14.5	14.3							
	802.11n (HT20) 6.5 Mbps	On	0	MIMO Main+Sub	Rear	6	2437.0	0.622	8.5	8.4	0.533	0.549		6
					Edge 1	6	2437.0	0.165	8.5	8.4	0.126	0.130	2	
Off		6	MIMO Main+Sub	Rear	1	2412.0	0.289	12.5	11.6	0.273	0.340	1		
				Edge 1	1	2412.0	0.146	12.5	11.6					

Note(s):

1. Highest reported SAR is ≤ 0.4 W/kg. Therefore, further SAR measurements within this exposure condition are not required.
2. Highest reported SAR is > 0.4 W/kg. Due to the highest reported SAR for this test position, other test positions in this exposure condition were evaluated until a SAR ≤ 0.8 W/kg was reported.
3. Testing for a second channel was required because the reported SAR for this test position was >0.8 W/kg.
4. Additional testing required in order satisfying FCC simultaneous transmission limit criteria.

10.6. Wi-Fi (U-NII Band)

Mode	Frequency Band	Mode	Pwr. Back-off	Dist. (mm)	Antenna	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Note	Plot No.		
										Tune-up limit	Meas.	Meas.	Scaled				
Standalone	5.3 GHz U-NII 2A	802.11ac (VHT80) 29.3 Mbps	On	0	SISO Main	Rear	58	5290.0	0.419	7.5	6.9	0.273	0.313	1			
						Edge 1	58	5290.0	0.310	7.5	6.9						
					SISO Sub	Rear	58	5290.0	1.222	7.5	7.0	0.502	0.567		7		
						Edge 1	58	5290.0	0.265	7.5	7.0	0.144	0.163		2		
		802.11a 6 Mbps	Off	6	SISO Main	Rear	60	5300.0	0.449	12.5	12.5	0.172	0.173		1		
						Edge 1	60	5300.0	0.398	12.5	12.5						
					SISO Sub	Rear	52	5260.0	0.590	12.5	12.1	0.256	0.284		1		
						Edge 1	52	5260.0	0.334	12.5	12.1						
		802.11ac (VHT80) 29.3 Mbps	On	0	MIMO Main+Sub	Rear	58	5290.0	0.883	7.5	7.0	0.522	0.586		8		
						Edge 1	58	5290.0	0.781	7.5	6.9	0.377	0.433		2		
		802.11n (HT20) 6.5 Mbps	Off	6	MIMO Main+Sub	Rear	52	5260.0	0.574	12.5	12.4	0.314	0.322		2		
						Edge 1	52	5260.0	0.938	12.5	11.8	0.404	0.474				
Standalone	5.5 GHz U-NII 2C	802.11ac (VHT80) 29.3 Mbps	On	0	SISO Main	Rear	106	5530.0	0.723	7.5	6.7	0.295	0.356	1			
						Edge 1	106	5530.0	0.391	7.5	6.7						
					SISO Sub	Rear	106	5530.0	0.986	7.5	6.4	0.430	0.549		9		
						Edge 1	106	5530.0	0.327	7.5	6.4	0.131	0.167		2		
		802.11a 6 Mbps	Off	6	SISO Main	Rear	112	5560.0	0.423	12.5	12.5	0.161	0.161		1		
						Edge 1	112	5560.0	0.409	12.5	12.5						
					SISO Sub	Rear	116	5580.0	0.462	12.5	12.0	0.195	0.218		1		
						Edge 1	116	5580.0	0.308	12.5	12.0						
		802.11ac (VHT80) 29.3 Mbps	On	0	MIMO Main+Sub	Rear	106	5530.0	1.421	7.5	6.7	0.408	0.494		10		
						Edge 1	106	5530.0	0.442	7.5	5.9	0.193	0.278		2		
		802.11n (HT20) 6.5 Mbps	Off	6	MIMO Main+Sub	Rear	100	5500.0	0.780	12.5	12.3	0.299	0.315		1		
						Edge 1	100	5500.0	0.768	12.5	11.8						
		Standalone	5.8 GHz U-NII 3	802.11ac (VHT80) 29.3 Mbps	On	0	SISO Main	Rear	155	5775.0	0.607	7.5	6.7	0.242	0.288	1	
								Edge 1	155	5775.0	0.302	7.5	6.7				
							SISO Sub	Rear	155	5775.0	1.082	7.5	7.4	0.449	0.465		11
								Edge 1	155	5775.0	0.491	7.5	7.4	0.165	0.171		2
802.11a 6 Mbps	Off			6	SISO Main	Rear	149	5745.0	0.524	12.5	12.4	0.214	0.217		1		
						Edge 1	149	5745.0	0.336	12.5	12.4						
					SISO Sub	Rear	149	5745.0	0.405	12.5	12.5	0.209	0.211		1		
						Edge 1	149	5745.0	0.336	12.5	12.5						
802.11ac (VHT80) 29.3 Mbps	On			0	MIMO Main+Sub	Rear	155	5775.0	0.981	7.5	7.4	0.450	0.460		12		
						Edge 1	155	5775.0	0.570	7.5	6.7	0.186	0.223		2		
802.11n (HT20) 6.5 Mbps	Off			6	MIMO Main+Sub	Rear	157	5785.0	0.737	12.5	12.2	0.271	0.291		1		
						Edge 1	157	5785.0	0.737	12.5	11.9						

Note(s):

1. Highest reported SAR is ≤ 0.4 W/kg. Therefore, further SAR measurements within this exposure condition are not required.
2. Highest reported SAR is > 0.4 W/kg. Due to the highest reported SAR for this test position, other test positions in this exposure condition were evaluated until a SAR ≤ 0.8 W/kg was reported.
3. Testing for a second channel was required because the reported SAR for this test position was >0.8 W/kg.
4. Additional testing required in order satisfying FCC simultaneous transmission limit criteria.

10.7. Bluetooth

Frequency Band	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
2.4 GHz	GFSK	0	Rear	39	2441.0	10.0	10.0	0.559	0.565	13
			Edge 1	39	2441.0	10.0	10.0	0.136	0.137	

11. SAR Measurement Variability

In accordance with published RF Exposure KDB 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

- 1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
- 3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
- 4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	First Repeated	
						Measured SAR (W/kg)	Largest to Smallest SAR Ratio
750	LTE Band 17	Standalone	Rear	No	0.480	N/A	N/A
850	WCDMA Band V	Standalone	Edge 1	No	0.585	N/A	N/A
	LTE Band 5	Standalone	Edge 1	No	0.713	N/A	N/A
1900	WCDMA Band II	Standalone	Rear	No	0.678	N/A	N/A
2400	Bluetooth	Standalone	Rear	No	0.559	N/A	N/A
	Wi-Fi 802.11b/g/n	Standalone	Rear	No	0.533	N/A	N/A
5300	Wi-Fi 802.11a/n/ac	Standalone	Rear	No	0.522	N/A	N/A
5500	Wi-Fi 802.11a/n/ac	Standalone	Rear	No	0.430	N/A	N/A
5800	Wi-Fi 802.11a/n/ac	Standalone	Rear	No	0.450	N/A	N/A

Note(s):

Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20.

12. Simultaneous Transmission SAR Analysis

KDB 447498 D01 General RF Exposure Guidance introduces a new formula for calculating the SAR to Peak Location Ratio (SPLSR) between pairs of simultaneously transmitting antennas:

$$SPLSR = (SAR_1 + SAR_2)^{1.5} / Ri$$

Where:

SAR₁ is the highest measured or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

SAR₂ is the highest measured or estimated SAR for the second of a pair of simultaneous transmitting antennas, in the same test operating mode and exposure condition as the first

Ri is the separation distance between the pair of simultaneous transmitting antennas. When the SAR is measured, for both antennas in the pair, it is determined by the actual x, y and z coordinates in the 1-g SAR for each SAR peak location, based on the extrapolated and interpolated result in the zoom scan measurement, using the formula of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$

In order for a pair of simultaneous transmitting antennas with the sum of 1-g SAR > 1.6 W/kg to qualify for exemption from Simultaneous Transmission SAR measurements, it has to satisfy the condition of:

$$(SAR_1 + SAR_2)^{1.5} / Ri \leq 0.04$$

Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations	
Standalone	1	W-CDMA	+ DTS
	2	W-CDMA	+ U-NII
	3	W-CDMA	+ BT
	4	LTE	+ DTS
	5	LTE	+ U-NII
	6	LTE	+ BT

Notes:

1. DTS supports Hotspot and Wi-Fi Direct.
2. U-NII supports Wi-Fi Direct.
3. W-CDMA and LTE supports Hotspot.
4. VoIP is supported in W-CDMA and LTE.
5. DTS Radio cannot transmit simultaneously with Bluetooth Radio.
6. U-NII Radio cannot transmit simultaneously with Bluetooth Radio.
7. U-NII Radio cannot transmit simultaneously with DTS Radio.

Estimated SAR for Simultaneous Transmission SAR Analysis

Considerations for SAR estimation

1. When standalone SAR test exclusion applies, standalone SAR must also be estimated to determine simultaneous transmission SAR test exclusion.
2. Dedicated Host Approach criteria for SAR test exclusion is likewise applied to SAR estimation, with certain distinctions between test exclusion and SAR estimation:
 - o When the separation distance from the antenna to an adjacent edge is ≤ 5 mm, a distance of 5 mm is applied for SAR estimation; this is the same between test exclusion and SAR estimation calculations.
 - o When the separation distance from the antenna to an adjacent edge is > 5 mm but ≤ 50 mm, the actual antenna-to-edge separation distance is applied for SAR estimation.
 - o When the minimum test separation distance is > 50 mm, the estimated SAR value is 0.4 W/kg
3. Please refer to Estimated SAR Tables to see which test positions are inherently compliant as they consist of only estimated SAR values for all applicable transmitters and consequently will always have sum of SAR values < 1.2 W/kg. Simultaneous transmission SAR analysis was therefore not performed for these test positions.

Estimated SAR for WWAN

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off																
Cellular	W-CDMA 5	846.6	23.50	224	2	3.4	193	191	44			-MEASURE	-MEASURE	0.400	0.400	-MEASURE
Cellular	W-CDMA 2	1907.6	23.00	200	2	3.4	163	191	108			-MEASURE	-MEASURE	0.400	0.400	0.400
Cellular	LTE Band 5	844	24.50	282	2	3.4	193	191	44			-MEASURE	-MEASURE	0.400	0.400	-MEASURE
Cellular	LTE Band 17	710	23.00	200	2	3.4	193	191	44			-MEASURE	-MEASURE	0.400	0.400	-MEASURE
Power Back-off, Proximity Sensor On																
Cellular	W-CDMA 5	846.6	17.00	50	2	3.4						-MEASURE	-MEASURE			
Cellular	W-CDMA 2	1907.6	12.50	18	2	3.4						-MEASURE	-MEASURE			
Cellular	LTE Band 5	844	18.00	63	2	3.4						-MEASURE	-MEASURE			
Cellular	LTE Band 17	710	17.50	56	2	3.4						-MEASURE	-MEASURE			

Estimated SAR for WLAN

Main Antenna

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)						
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	
Wi-Fi Main Antenna Max.																
Wi-Fi 2.4 GHz	2462	14.50	28	3.1	3.4	81	188.5	196.2				-MEASURE	-MEASURE	0.400	0.400	0.400
Wi-Fi 5.3 GHz	5320	12.50	18	3.1	3.4	81	188.5	196.2				-MEASURE	-MEASURE	0.400	0.400	0.400
Wi-Fi 5.5 GHz	5700	12.50	18	3.1	3.4	81	188.5	196.2				-MEASURE	-MEASURE	0.400	0.400	0.400
Wi-Fi 5.8 GHz	5825	12.50	18	3.1	3.4	81	188.5	196.2				-MEASURE	-MEASURE	0.400	0.400	0.400
Bluetooth	2480	10.00	10	3.1	3.4	81	188.5	196.2				-MEASURE	-MEASURE	0.400	0.400	0.400
Wi-Fi Main Antenna Reduced.																
Wi-Fi 2.4 GHz	2462	8.50	7	3.1	3.4							0.293	0.293			
Wi-Fi 5.3 GHz	5320	7.50	6	3.1	3.4							0.369	0.369			
Wi-Fi 5.5 GHz	5700	7.50	6	3.1	3.4							0.382	0.382			
Wi-Fi 5.8 GHz	5825	7.50	6	3.1	3.4							0.386	0.386			

Sub Antenna

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)						
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	
Wi-Fi Main Antenna Max.																
Wi-Fi 2.4 GHz	2462	14.50	28	3.1	3.4	95.5	188.5	177				-MEASURE	-MEASURE	0.400	0.400	0.400
Wi-Fi 5.3 GHz	5320	12.50	18	3.1	3.4	95.5	188.5	177				-MEASURE	-MEASURE	0.400	0.400	0.400
Wi-Fi 5.5 GHz	5700	12.50	18	3.1	3.4	95.5	188.5	177				-MEASURE	-MEASURE	0.400	0.400	0.400
Wi-Fi 5.8 GHz	5825	12.50	18	3.1	3.4	95.5	188.5	177				-MEASURE	-MEASURE	0.400	0.400	0.400
Wi-Fi Main Antenna Reduced.																
Wi-Fi 2.4 GHz	2462	8.50	7	3.1	3.4							0.293	0.293			
Wi-Fi 5.3 GHz	5320	7.50	6	3.1	3.4							0.369	0.369			
Wi-Fi 5.5 GHz	5700	7.50	6	3.1	3.4							0.382	0.382			
Wi-Fi 5.8 GHz	5825	7.50	6	3.1	3.4							0.386	0.386			

12.1. Sum of the SAR for WWAN & Wi-Fi & BT

Test Position	Standalone SAR (W/kg)				Σ 1-g SAR (W/kg)		
	WWAN ①	DTS Main ②	DTS Sub ③	DTS MIMO ④	WWAN + DTS Main ① + ②	WWAN + DTS Sub ① + ③	WWAN + DTS MIMO ① + ④
Rear	0.766	0.456	0.395	0.549	1.222	1.161	1.315
Edge 1	0.795	0.224	0.395	0.130	1.019	1.190	0.925
Edge 2	0.400	0.400	0.400	0.400	0.800	0.800	0.800
Edge 3	0.400	0.400	0.400	0.400	0.800	0.800	0.800
Edge 4	0.298	0.400	0.400	0.400	0.698	0.698	0.698

Test Position	Standalone SAR (W/kg)					Σ 1-g SAR (W/kg)			
	WWAN ①	U-NII Main ②	U-NII Sub ③	U-NII MIMO ④	BT ⑤	WWAN + U-Nii Main ① + ②	WWAN + U-NII Sub ① + ③	WWAN + U-NII MIMO ① + ④	WWAN + BT ① + ⑤
Rear	0.766	0.356	0.567	0.586	0.565	1.122	1.333	1.352	1.331
Edge 1	0.795	0.356	0.171	0.474	0.137	1.151	0.966	1.269	0.932
Edge 2	0.400	0.400	0.400	0.400	0.400	0.800	0.800	0.800	0.800
Edge 3	0.400	0.400	0.400	0.400	0.400	0.800	0.800	0.800	0.800
Edge 4	0.298	0.400	0.400	0.400	0.400	0.698	0.698	0.698	0.698

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is ≤ 0.04 for all circumstances that require SPLSR calculation.

Appendixes

Refer to separated files for the following appendixes.

4787827147-S1V2 FCC Report SAR_App A_Photos & Ant. Locations

4787827147-S1V2 FCC Report SAR_App B_Highest SAR Test Plots

4787827147-S1V2 FCC Report SAR_App C_System Check Plots

4787827147-S1V2 FCC Report SAR_App D_SAR Tissue Ingredients

4787827147-S1V2 FCC Report SAR_App E_Probe Cal. Certificates

4787827147-S1V2 FCC Report SAR_App F_Dipole Cal. Certificates

END OF REPORT